flightsimlabs



A320-X

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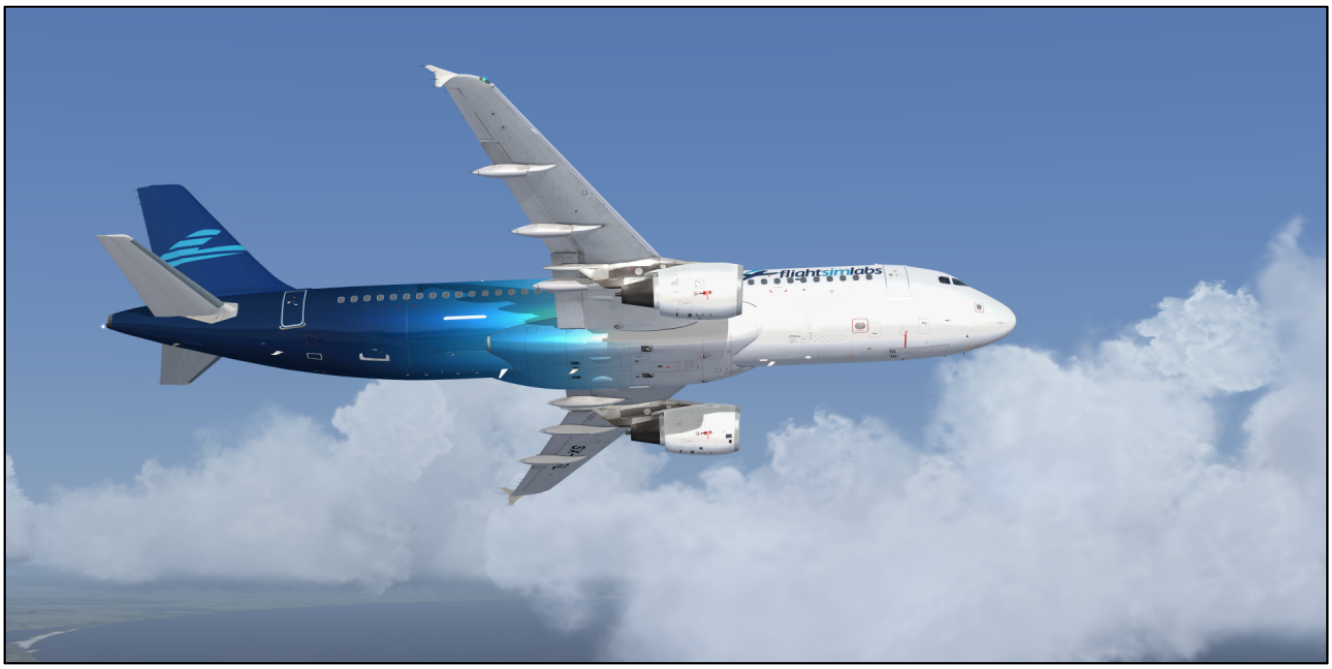
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1. INTRODUCTION

Welcome to the Flight Sim Labs A320-X desktop flight simulation of the A320. The aircraft you have just purchased is one of the most complex and accurate simulations of a commercial passenger aircraft ever offered to the flight simulation enthusiast. Whether your interests lie in simply recreating real world A320 flight operations or an in-depth study of the multiple systems that make up this modern jet airliner, we think you will thoroughly enjoy the A320-X.



According to aviation historians, the A320 aircraft was first conceived in June 1977 as an unnamed single-aisle passenger jet capable of carrying 130 to 188 passengers and flying at a cruise speed of Mach .84. It would take four more years before the aircraft was given the A320 designation and another seven years to receive certification by European aviation authorities.

Work on the FSLabs A320-X began in March 2010 right after the very successful launch of the Concorde-X product. Much like its real-world counterpart, the FSLabs A320-X would undergo a long development process which exceeded six years and consisted of three major and countless minor design overhauls before it could finally be ”delivered” to its first customers.

You may wonder why the development process for this simulation took so long. The answer is simple. The real-world A320 is a very complex aircraft.

The A320 utilises a revolutionary fly-by-wire concept that is primarily driven by a side-stick (as opposed to a traditional yoke) which sends commands as electrical signals to the various components that move the aircraft’s control surfaces. To accomplish this, there is a need for multiple computers to not only control the flight surfaces but also to continuously check that pilot inputs do not jeopardise the aircraft, its crew or its passengers by taking it outside a safe flight control envelope. In addition to the primary computers, the introduction of a glass cockpit concept into this dynamic environment necessitated adding secondary and even tertiary computers, all communicating with each other via a network of thousands of wires which are interconnected via terminal blocks and wiring modules. These computers are powered from several different electrical sources with multiple redundancies built-in to protect against single or multiple equipment failures.

The FSLabs A320-X manages to simulate its real-world counterpart very reliably because it models this wiring connectivity with extreme accuracy and fidelity, right down to a given aircraft component’s individual wiring connections. In the same fashion, hydraulic fluids travel the simulated hydraulic piping network with manifold pressures, temperatures and flow control that allows each component to work (or fail) in the same way as the real-world version.

Relays, switches, diodes, fuses, inverters, pressure switches, fuel, air valves, pumps, filters, generators - even individual circuit breakers are all modelled and simulated. Voltages, currents and their effects are propagated through the system to blend with the digital signals transmitted and received, all utilising the same ARINC protocols found in the real aircraft.

In the real A320, all these signals - analogue and digital together - are inputted into and used by over fifty different on-board computers as part of the fly-by-wire concept. All of these computers are modelled accurately by the FSLabs A320-X to produce a simulation of the A320 for a desktop computer that is unrivalled in its complexity, depth of systems recreation and accuracy.

Airline pilots have always complained that a desktop simulator version of any passenger jet would never be able to accurately model how the actual aircraft flies. The FSLabs A320-X now makes this possible. A sampling of some of innovations modelled in the A320-X includes:

- Recreating the "system behind the systems" that simulates the data flow/connections utilising networks in the same way as the real A320.
- Recreating the real wiring, connectors, relays, switches and servos from the real A320.
- Custom coding of the A320's Fly-By-Wire ("FBW") system, utilising complex control loops for maximum accuracy and realism.
- Complete recreation of the Electronic Flight Control System ("EFCS").
- Complete recreation of Normal, Alternate and Direct Laws and Mechanical Backup.
- New rolling and sliding coefficients, dynamically loaded when using the A320-X, allowing a realistic handling of the aircraft in all situations. This allows for realistic breakaway thrust from a stop, realistic single engine taxi operations and accurate stopping distances on dry, wet, snow and iced surfaces.

These and many other performance characteristics and idiosyncrasies of the real world aircraft have all been faithfully recreated in the FSLabs A320-X. How was this accomplished?

Engine and Aerodynamics External Modelling

In the early stages of development FSLabs spent considerable time to understand how FS models work so as to identify strengths and weaknesses of the Prepar3D flight and engine modelling. We found that while the rendering performance of low and slow subsonic aircraft like GA aircraft was modelled quite accurately, things started to drift with airliners and jet aircraft.

With our previous experience in developing the Concorde-X, we turned into external engine and aerodynamics models, dividing the work into three different sections, one each for engines, aerodynamics and ground modelling.

For our engine modelling, we used various papers available in literature describing gas turbines performance evaluation. Each modelling phase is linked to the behaviour of its respective component (compressors, burner, turbines, etc.) and described by its mapped characteristics. Data collected on their real counterparts were used to fine-tune the overall model via an iterative process.

For our aerodynamic modelling, we divided the wings into discrete sections and ran various Computational Fluid Dynamics calculations to establish moment, lift and drag coefficients. Combined with documented tables and data collected on the real aircraft, this allowed highly accurate aircraft aerodynamics renditions.

The ground model represents the interaction between the wheel system and ground. Other more simplistic approaches try to do this by fake-adjusting engine parameters to the default P3D friction model, but we were able to model real longitudinal frictions of the wheels in various runway conditions instead. This was critical to render accurate taxi behaviour with accurate idle engine thrust which are different and typical for each engine version. While IAE engine variants accelerate gently around 60T with engine idle, the CFM counterparts just maintain its taxi speed.
Lateral frictions were also calculated to accurately render single engine taxi and cross wind landing: now the pilot has to properly de-crab the aircraft before touch-down!
Based on real aircraft numbers, we also adapted brake friction coefficients to allow stop distances under pure wheel braking action to be spot on in dry, wet, snowy and iced runway.
Last, but not least, brake temperatures were accurately modelled as a result of energy balancing calculations between energy income given by braking action and thermal dissipation based on various parameters including temperature difference between air and discs, chill effect due to relative wind, etc.



These engine and aerodynamics models run in separate threads while you fly the A320-X. They are continuously computing all necessary parameters so that the overall result very closely matches actual aircraft performance over a wide array of flight conditions, including changes relative to International Standard Atmosphere (Delta ISA), Mach number, pressure altitude and runway conditions. The real beauty of it, though, is that all this is accomplished with a minimal CPU and VAS footprint, thereby ensuring a fluid simulation for any of the modern computer system setups.

2. LOADING THE A320-X

Use the following two methods to load the A320-X into P3D:

CREATE A NEW FLIGHT

Creating a new flight from the scenario setup screen will place you at the location chosen with the following two possibilities:

- If you haven't chosen a default panel state as described later in this chapter, the airplane will be loaded with engines running.
- If you have selected a default panel state, then creating a new flight from the scenario setup screen will always load the selected default panel state.

LOAD A SAVED FLIGHT

Launch P3D, choose "Load…" from the scenario setup menu and select a saved flight you have created which uses the A320-X. The panel state and the livery you were using when you saved the flight will be loaded.

Note: It is not recommended to switch from one A320-X livery to another within the same flight. You should instead close P3D and create or load a new flight.

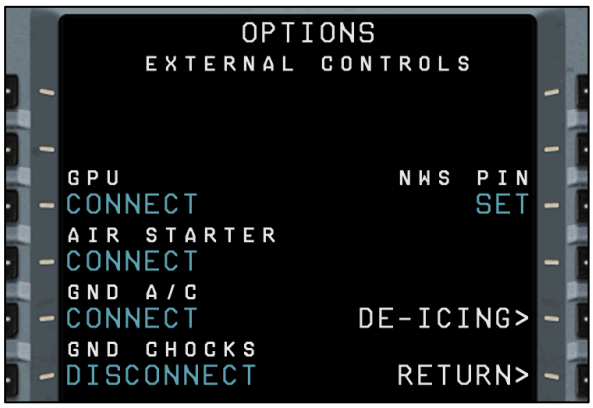
It is also recommended to turn off the P3D internal crash detection. The high aircraft system complexity will make the automated reload after a detected crash unreliable for further flight.

Setting-Up the Aircraft

After the A320-X is loaded into P3D, you will have either the engines running or a completely cold and dark cockpit.
To get some external power while the aircraft is still cold and dark, you may use the captain's MCDU (SHIFT+6) to simulate contacting the ground crew:

Press and hold the 'BRT'-key on the MCDU until you see text being displayed.
Select 'OPTIONS>', then '<EXT CTRLS' to get to the external connections menu providing the following options:

- **GPU** (Ground Power Unit) - Supplies the aircraft with ground power without the need to start and run the APU while parked.
- **Air Starter** – Provides external pressurised air to enable an engine start without the APU.
- **GND A/C** – Provides conditioned external air to the aircraft to control cabin temperature while parked at the gate.
- **GND Chocks** – Places chocks around the nose- and main gear to prevent aircraft movement. Chocks are always used independent of the parking brake.
- **NWS Pin** – The nosewheel gear pin can be manually inserted or removed. Usually this is done automatically by GSX.
- **De-Icing** – Access to de-icing treatment, see chapter 5 for details.



Loading and Saving a Panel State

The A320-X offers a panel state loading and saving functionality. You can either load a panel state manually, or have a panel state loaded that was automatically saved after using the P3D 'save flight' functionality.
The A320-X offers 4 panel states to be loaded manually. These panel states may be customised and saved individually for each installed airline livery. You also have the ability to choose a default configuration state you wish to be loaded when creating a new flight.

PANEL STATE OPTIONS

To access the panel state options, display the Captain's MCDU as described on the previous page. Press the 'MCDU MENU' key if the MCDU menu is not displayed already.

Then select 'PANEL STATES>' from the MCDU menu **(1)**.
The following options are available within the Panel States menu:

Load State – (2)
Load the desired panel state:

Cold and Dark – The aircraft is powered down completely, with no external services connected.

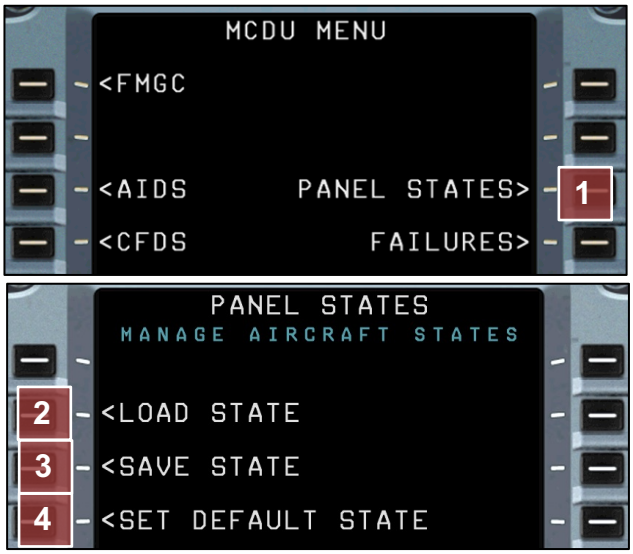
On GPU - The aircraft is connected to external power with many systems, such as the ADIRUs, still switched off. A typical state which pilots will find the aircraft in when boarding it at the gate.

On APU – The aircraft is already running under its own power with the APU and packs running and ADIRUs aligned. A typical state a return flight is started after a short turnaround time.

Engines Running – The aircraft is ready for taxi with engines running. Note however that the FMGC does not contain any data.

To load a panel state, select the desired configuration and confirm the selection by pressing the LSK 6R.

Save State – (3)
Enables you to customise any of the 4 panel states mentioned above. See below for details.



Set Default State – (4)
Select the desired panel state you wish the aircraft to be loaded with when creating a new flight.

Note: This setting will be disregarded when loading a saved flight created with the A320-X. In this case, the panel state of that saved flight will be loaded automatically.

SAVING A PANEL STATE

This function is only needed if you wish to alter any of the 4 provided panel states, say to customise the panel state to any specific airline or to your own liking. You do not need to save a panel state manually when saving a flight to be loaded at a later time. In this case the panel state will be saved automatically.

The changes to a panel state are being saved individually for each installed livery. So if you for example change the panel state 'On APU' while having the British Airways A320 loaded, that saved panel state will not be present when you fly a Lufthansa airplane. Instead you will be able to save a new 'On APU' panel state for that airline.

To change and save a panel state, simply select '<SAVE STATE' **(3)** and then click the LSK next to the state you wish to overwrite. Confirm your selection by pressing the LSK 6R.
The customised panel states are saved within a file which you may share with other users.

File name and location:
<your add-on folder>**\FSLabs\SimObjects\Airplanes\FSLabs A32X\Airlines\<airline code>\Config\AircraftState.ini**

Whenever you change a panel state, a corresponding folder using the airline's ICAO code will be created, along with the AircraftState.ini file. So if you were to save a customised panel state while having the British Airways aircraft loaded, a folder named "BAW" would be created.

3. A320-X CONFIGURATION

MCDU Option Pages

The Master Control Display Unit (MCDU) can be used to change various aircraft specific settings, to enable or arm system failures and to perform various tasks such as opening doors, fuelling or loading the aircraft.

To access the configuration option pages, use either the pop-up MCDU in the 2D panel or the MCDU within the virtual cockpit.

1. If the display of the Captain's MCDU is blank, press and hold the "BRT" button **(1)** to turn the unit on.
2. On the MCDU **press the "MCDU MENU" button (2), then "OPTIONS >"** to get the options page:



MCDU Options Page 1 / 3		
Menu Title		Good to know
MAINT (Maintenance)	Perform maintenance actions such as: • Re-stowing a deployed Ram Air Turbine • Re-filling engine oil • Resetting electrical system components • Windshield cleaning	Can only be done on ground.
EFIS	Optional synchronisation of the barometric pressure switches between Captain and First Officer.	Can be used to simulate the other crewmember setting the same QNH as you do.
FIRE (Fire Protection)	Refill any fire suppression agent bottle using this menu.	
FUEL	Quickly add or remove fuel in various fuel tanks or as a total fuel amount.	For details, see chapter 5.
PAYLOAD	Sets the payload of the aircraft. The possible settings are: • Zero Fuel Weight • Number passengers per compartment • Cargo weight per compartment • Catering / Water • Airframe weights	For details on how to load passengers manually, see chapter 5.
EXT CTRLS	Offers external services and connections performed by the ground crew: • De-ice service • Air Starter unit • Ground Power and Air • Chocks • Steering Pin	In addition to these manual options, external services can also be managed automatically in conjunction with GSX. For details, see chapter 5.

UNITS (Units of Measurement)	Set the units of measurement for: • Air temperature (Degrees °F / °C) * • Weight (Imperial / Metric) * • Liquid volume (Litres / Quarts) * • Barometric pressure (inHg / hPa) * • Metric ALT display on PFD (Yes / No) *	
FWC / SDAC (Flight Warning Computer / System Data Acquisition Concentrators)	• See the FWC flight phase • Adjust height callouts. * • **V ONE INST** – Provides a system-generated callout when reaching the V1 decision speed. * • **PR MON INST** – If inactive: Suppresses ADR system faults caused by sudden air pressure changes due to unrealistic weather data. • **PIN PROG** – Enables or disables a "cabin ready" memo logic that integrates the 'Cabin Ready'-message into the take-off or landing config tests. * Ice detectors may be removed for airlines that don't have them on their aircraft. *	
FMGC (Flight Management and Guidance Computer)	Options for the Flight Management and Guidance Computer: • **DB Selector** – Allows to change between two different navigation databases. • **Pause at T/D** – Triggers a pause in the simulation at the start point of the descent. • **FPLN REQ W ENG ON** – Enables or disables the ability to request flightplans via datalink when the engines are running. • **Max Routes** – Sets the max. number of routes that can be stored in the FMGC. • **ARPT RWY Limit** – Sets the min. RWY length required to display an airport on the Navigation Display (in metres). *	
ADIRUS	Influence the time it takes to align the inertial platforms and sensors. • Default option is set to **"Realistic"**, meaning the alignment time will vary depending on latitude. • **"Fast"** will accelerate the alignment process considerably.	
ENGINES	Re-connect a disconnected IDG (Integrated Drive Generator).	This can only be done on ground with engines off.
DOORS	Open and close doors on the main deck and the lower deck.	In addition to these manual options, doors can also be managed automatically in conjunction with GSX. For details, see chapter 5.

*** Airframe-specific options** Options that are defined per airframe and may come with each installed livery or airline pack.

MCDU Options Page 2 / 3		
Menu Title		Good to know
EFCS	Allows to adjust the tolerance for flight control movement before the autopilot disconnects. A value of 0 means no tolerance, 1 equals the full movement before a disconnect happens.	
AMI	Default Thrust Reduction / Acceleration • Altitude * • Default ENG OUT Acceleration ALT *	* Options are set specific to each airframe
CIDS	• **Cabin Ready Logic** – Set conditions to be met in order to get the "Cabin Ready" notification. The setting "AUTO" will take the passenger load and other factors into account, before the cabin crew will notify the cockpit. Using the setting "READY", the cabin will always be ready. • **Call when ready** – Choose whether you want to get called by cabin crew to report ready. Can be disabled if you'd like to have the ECAM message only. * • **Print Slide Status** – Disable or enable the on-screen message for the slides being armed or disarmed. • **Boarding Music** – Enable the boarding music being played in the cabin. * • **Door 1L Auto Logic** – Set the behaviour for door closing after boarding is completed. "MANUAL" will give you as the pilot the final word on when the door is to be closed. "AUTO" will provide a realistic and random time it takes for the cabin crew to close the door themselves. "FAST" will have the cabin crew closing the door immediately after boarding is completed.	For details see chapter 5.
Reset Sys Options	Reset the airframe specific options of either the currently loaded airframe, or ALL installed airframes. This will erase all changes you have made for the airframe-specific options using the MCDU. For more information on these airframe-specific options, please refer to the document "**A320-X Aircraft Options**".	

*** Airframe-specific options**	Options that are defined per airframe and may come with each installed livery or airline pack.

MCDU Options Page 3 / 3		
Menu Title		Good to know
SEAT SELECTION	Set this selection to F/O if you intend to fly sitting on the first officer side. Note that this will not automatically switch the viewpoint in the virtual cockpit. It will however set which of the two sidesticks gets animated.	
SOUNDS	**Threaded Sounds** - Set this option to OFF if you own a lower-end CPU with a high usage on all cores and you experience stutters within the simulation. **Airport Sounds** – Enable or disable airport background noise from outside of the aircraft. The volume of these sounds depends on whether cabin doors or flight deck windows are open or closed. **Sound Volumes** – Allows you to set the volume of FSLabs' own sounds, independent of P3D sound settings. **Sound Devices** – Set the sound device used for different categories of sounds.	ACP stands for 'Audio Control Panel', meaning sounds such as passenger announcements and cabin communication. Default sound volumes: Engines – **50%** Environment – **80%** Cockpit – **70%**
CONTROLS	Configure thrust control, brakes and nose wheel steering.	See chapter 4 for more information.
HTTP SVR	Allows you to change the port setting used for the remote MCDU and Fuel Panel. You may also turn off this connectivity if desired.	
DISPLAYS	Change the refresh rate of the display units. Lower values may help to improve the overall framerate of P3D. You may also change the time required for the DU self-test upon powering up the aircraft.	
VISUALS	**Tomato Shader** - If the 'Tomato Shade' shader tool is used, this option can be enabled to have optimised raindrop effects displayed in the Virtual Cockpit. **Windshield Bugs** – Disable bug splashes and other dirt accumulating on the windows.	Profiles for Tomato Shade can be obtained from the support forum's download section: Link to forum

AIRLINE-SPECIFIC OPTIONS PER AIRFRAME

Each installed livery can contain airframe-specific options mentioned in the tables above.
For more information on these airframe-specific options, please refer to the document "**A320-X Aircraft Options**".

Recommended Active Sky Settings

For a realistic weather experience, FSLabs encourages users to fly using a programme that provides real-time weather information to the simulation. However, we strongly recommend that you adjust the turbulence settings on any of these programmes.

Turbulence effects within P3D and the various aftermarket weather programmes tend to be stronger and interact with the airframe unrealistically when compared to real aircraft. This has the undesired result of negatively affecting the autopilot that has been programmed to real-world specifications.

Active Sky for Prepar3D v4 is FSLabs preferred weather programme as it delivers precipitation data to the A320-X's weather radar: http://hifisimtech.com

RECOMMENDED SETTINGS FOR ASP4

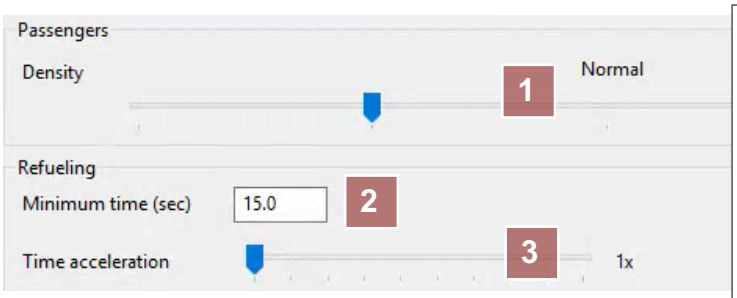
Max Cloud Turbulence: **20%** Turbulence Effect Scale: **20%**
Max Wind Turbulence: **20%** Enhanced Turbulence: **Disable**
Realistic thunderstorm up and downdraft rate: **Disable**

Recommended GSX Settings

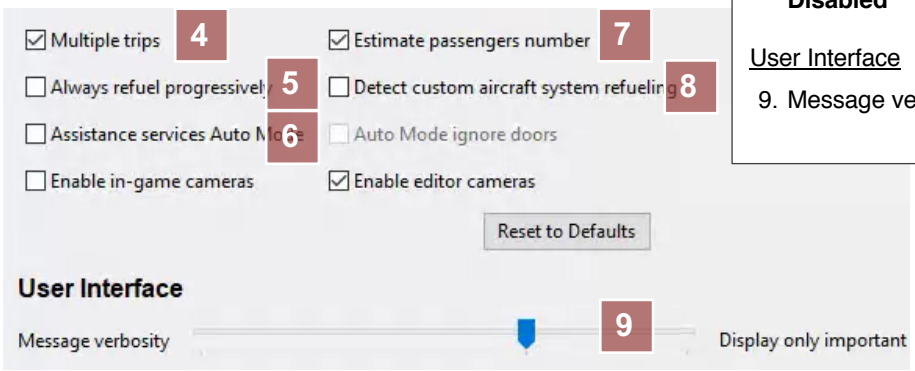
For a realistic ground handling experience, FSLabs recommends using the add-on "Ground Services X" by FSDreamteam. GSX will provide the user with automated door, payload and fuel handling, as well as handling external connections to the aircraft. Furthermore, handling of the GSX software is fully incorporated within the A320X, doing away with the need of manually opening GSX menus. GSX will instead be triggered by doing the standard operating flows during flight preparations.

To ensure a trouble-free experience for GSX users, the following settings within the GSX software are recommended:

Timings



Simulation Parameters



Timings

1. Passengers – Density: **Normal** or **Dense**
2. Refuelling – Minimum time: **15s**
3. Refuelling – Time acceleration: **1x**

Simulation Parameters

4. Multiple trips: **Enabled**
5. Always refuel progressively: **Disabled**
6. Assistance services Auto Mode: **Disabled**
7. Estimate passengers number: **Enabled**
8. Detect custom aircraft system refuelling: **Disabled**

User Interface

9. Message verbosity: **Display only important**

All other settings can be adjusted to the users liking.

4. HARDWARE CONTROLS SETUP

Thrust Lever and Thrust Detent Configuration

The default thrust lever configuration is set for a single joystick axis that controls both throttle levers simultaneously. If this is the configuration you have and you do not wish to alter the position of the thrust detents, then you may skip this thrust lever configuration chapter.

If, however, you use one hardware lever per engine or you utilise your hardware to command reverse thrust, then use the following MCDU setup functions to configure the A320 thrust levers:

1. Navigate to the option pages as described in the previous chapter.
2. Press the left or right pointing arrow key to go to the third options page.
3. Press the LSK next to '< CONTROLS'
4. Select '<THRUST LEVERS' to access the thrust lever control settings.

The following settings are available:

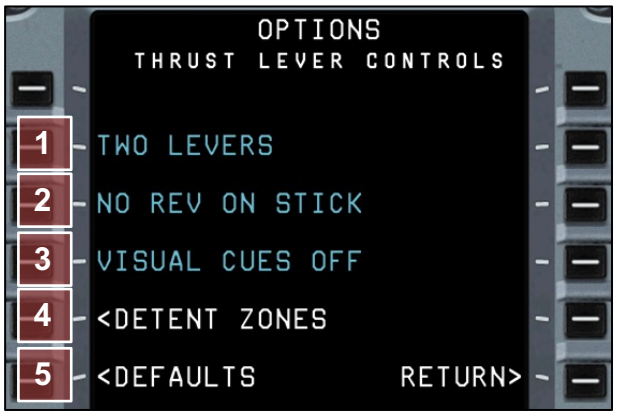
Number of throttle levers – (1)
Select the number of joystick throttle levers you use for the engines, one or two levers.

Enable reverse range – (2)
Enables you to use your joystick engine levers for reverse thrust by setting a range.

Visual cues for thrust detents – (3)
Enables or disables a visual text prompt at the top of the simulator screen indicating in which throttle detent the levers have been placed.

Set detent zones – (4)
Allows for fine-tuning of the throttle detents along your thrust lever(s) axis (or axes).

Reset to default settings – (5)
Reverts to standard detent settings.

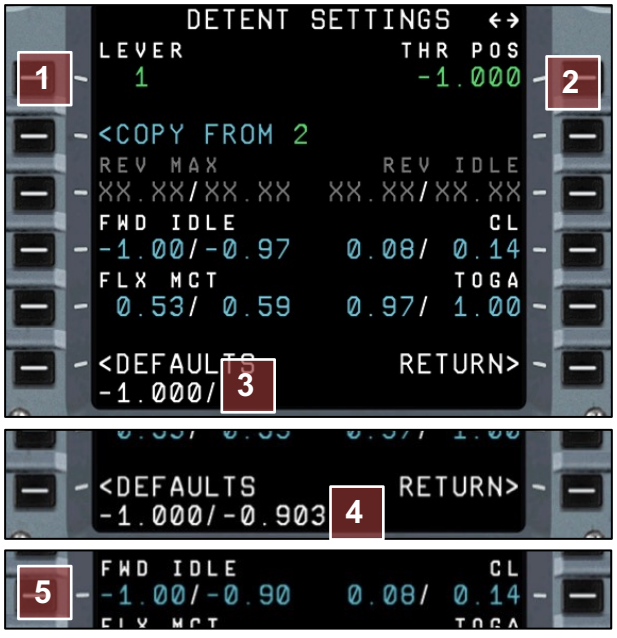


Note: Standard detent settings should be fine for most users. Try them out first before you adjust any values.

HOW TO SET CUSTOM DETENT ZONES:

Note: In this particular example, the forward idle detent is adjusted, to make the detent larger so that more of the available movement range of the joystick lever is used.

1. Select the "SET DETENT ZONES" option as described above.
2. If using two throttle levers, decide which one you want to adjust **(1)**
3. Move your joystick lever to the position you wish to set as the "beginning" of the detent you want to change.
4. Press the Line Select Key 1R **(2)** to copy this position into the scratch pad **(3)**.
5. Move the joystick lever forward to the desired "end" of the detent.
6. Again press the LSK 1R to copy this value into the scratchpad behind the first one **(4)**.
7. Press the LSK 4L to change the values for the detent **(5)**.
8. A reload of the aircraft may be necessary for these settings to take effect.



Steering Tiller

The A320-X has the ability to simulate the use of a small hand operated steering wheel called a “tiller” to steer the aircraft while taxiing on the ground (“Nose Wheel Steering” or “NWS”). You can use the Options page in the MCDU to set this functionality based on your hardware setup. The real A320 can be steered by either the rudder pedals or the tiller. While the tiller offers the pilots full deflection (left to right movement) of the nose wheel, the rudder pedals are limited to turning the nose wheel only 6° to either side. Pilots use the tiller to steer the aircraft during taxi and the rudder pedals to steer the aircraft down the runway on the take-off roll.

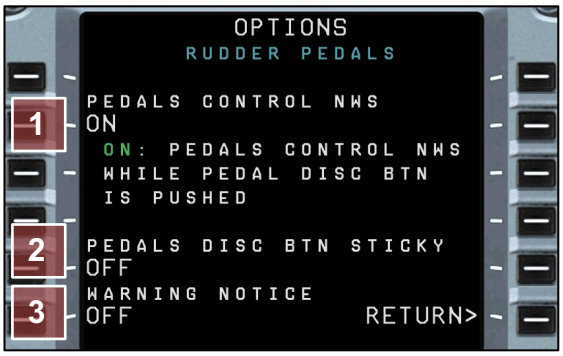
For maximum realism, the rudder and the tiller should each have their own axis assigned. A popular way to do this is to utilise the twist axis of a joystick (assuming your hardware has such an axis) to control the tiller and your rudder pedals to control the rudder axis. However, if only a single axis is available for steering on ground, then the A320-X offers a configuration option for that scenario as well.

To access the steering options, select the MCDU option page as described in chapter 3.
Select ‘<CONTROLS’, then ‘RUDDER PEDALS>’

SINGLE AXIS SETUP

"I only have rudder pedals - I cannot assign any separate joystick axis for the steering tiller"

If you only have a rudder axis (either on the joystick or through the rudder pedals) which you have assigned to control rudders in P3D, then set Pedals Control NWS to “**ON**” using LSK 2L on the Rudder Pedals Option Page **(1)**. This results in the rudder pedals controlling the rudder the same way you are used to in the simulator. They will also control NWS but their effect is limited to +/- 6 degrees turn, just like the real A320. However, by pressing the PEDAL DISC key (by default, this is the "comma" key), the rudder pedals stop controlling the rudder axis and instead act as the steering tiller. The rudder pedals will provide full NWS. You can see the tiller turning in the Virtual Cockpit as you move your rudder pedals. When you release the PEDAL DISC key, the rudder pedals will go back to moving the rudder and will be limited to the +/- 6 degrees for the nose wheel.
Choose whether you need to keep the PEDALS DISC button depressed to act as tiller **(2)**, or if it works as an on/off-switch.
A on-screen warning message can be enabled for whenever the PEDALS DISC button is depressed **(3)**.

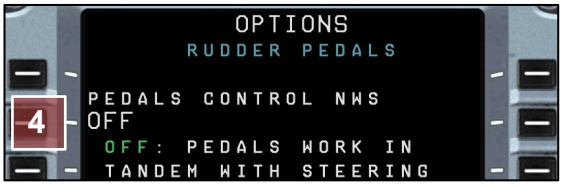


Single axis setup for rudder pedals and tiller control.

DUAL AXIS SETUP

"I have rudder pedals and I can assign a separate steering tiller axis"

If you have rudder pedals and you can assign a different joystick axis to act as a tiller, then set Pedals Control NWS to “**OFF**” using LSK 2L on the Rudder Pedal Option Page **(4)**. This results in the rudder pedals only controlling the rudder axis and NWS to that +/- 6 degree limit. The joystick axis that you set up in P3D or FSUIPC will now serve as your steering tiller while on the ground, providing full deflection of the NWS. In other words, you will have two axes set up in P3D, one for the rudder and one for the tiller.



Dual axis setup for rudder pedals and tiller control.

In addition, you will have the PEDAL DISC functionality to disconnect the rudder pedals from the +/- 6° limit. This means that while the PEDAL DISC button is depressed (“comma” key), moving the rudder pedal axis will have no effect on the NWS and will only cause the rudder of the aircraft to move. This is useful to test the rudder control while taxiing and not having the NWS move. When you release the PEDAL DISC button, the rudder pedals will go back to moving the NWS.

Enable the tiller axis by assigning “Steering Set” either within the P3D controls settings, or via FSUIPC, to the desired joystick axis.

Note: If you need to re-assign the ‘PEDAL DISC’ button to a different key, you may do so via the P3D menu bar. Select the ‘Add-Ons’ tab, then ‘FSLabs’, followed by ‘Keyboard Commands’.

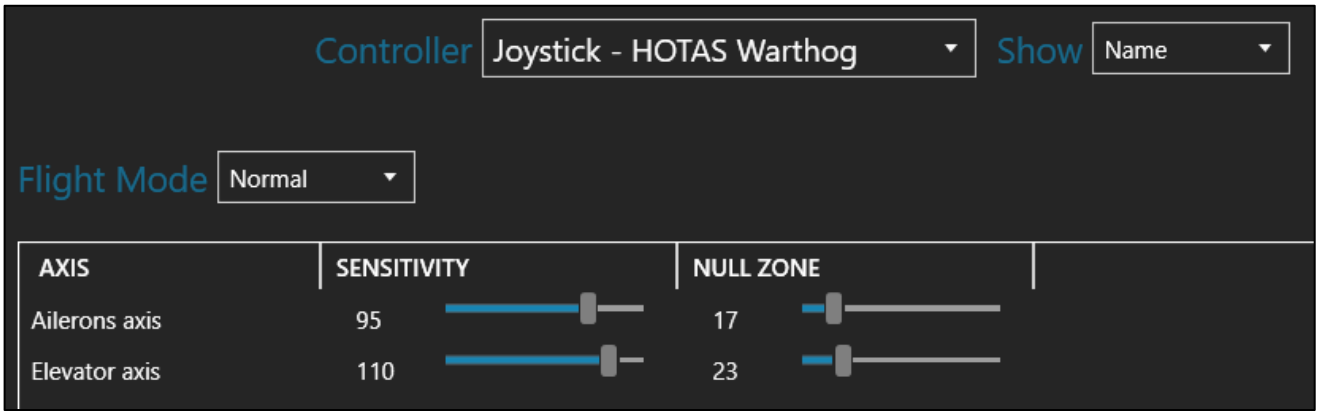
Flight Controls

To get the flight control response to resemble the real aircraft as close as possible, use these recommended settings either in P3D or within FSUIPC. The null zones are of special importance, because the flight control computers need an uninterrupted "neutral" setting of the flight stick to perform their magic flawlessly.

P3D SETTINGS

Use these P3D sensitivity and null zone settings if you are not using FSUIPC to set up your stick and throttle:

Sidestick



Thrust Levers
Throttle (1/2) axis: Maximum sensitivity
Null zone: As low as your hardware allows

Rudder Pedals
Rudder and brake axis: Maximum sensitivity
Null zone: As low as your hardware allows

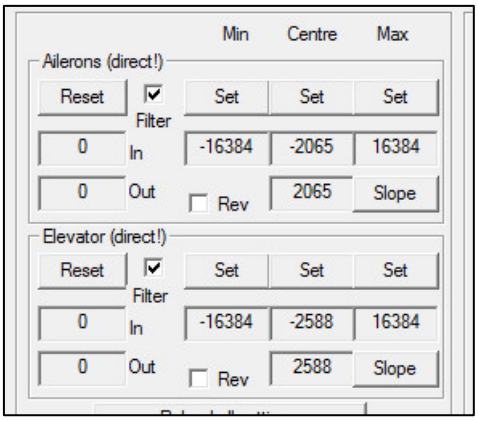
Steering Tiller
Maximum sensitivity
Null zone: As low as your hardware allows

FSUIPC SETTINGS

Use these recommended settings for null zones if you use FSUIPC to configure your stick axes:

Ailerons: **12%** of the full movement range number.
Elevator: **16%** of the full movement range number.

It will look like this, if your flight controls feature the same number (16384) for full movement to one side. If that number differs, then adjust the null zones accordingly.



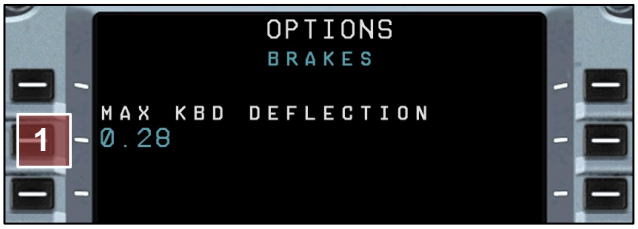
BRAKES

Note: Adjusting the brakes using the option below has no effect on brake behaviour using hardware rudder/brake pedals. This is for use with keyboard and joystick button brake application only.

1. Navigate to the option pages as described in the previous chapter.
2. Press the left or right pointing arrow key to go to the third options page.
3. Press the LSK next to '< CONTROLS'
4. Select 'BRAKES >' to access the brakes setting.

Max Keyboard Deflection – (1)
Sets the maximum amount of brake pedal travel that is applied using the keyboard or joystick button for brake application. This example means 28% of full brake pedal deflection. Be aware that it is impossible to apply maximum braking power with any value that is less than 1.0 .

Note that the brake pedal deflection is automatically increased beyond this setting depending on the taxiway/runway surface condition. This simulates pilots having to apply more braking power on contaminated surfaces.



Note: The standard setting should be fine for most users. Try it out first before you adjust the value.

Printer

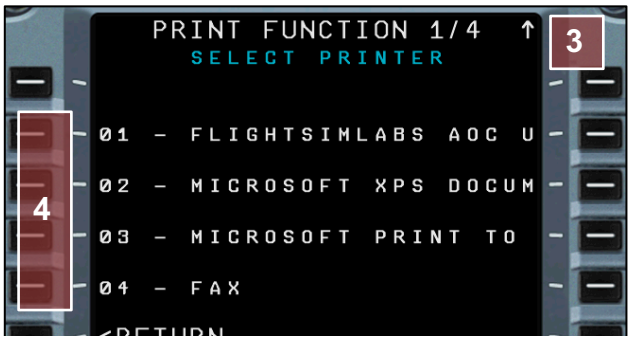
The A320-X supports printers, used to print data and messages coming from systems like ATSU (datalink) and others. Any Windows printing device is supported and can be set up using the MCDU:

The printer setup page can be accessed via the MCDU 'DATA' menu.

1. On the MCDU **press the "DATA" button (1), then "PRINT FUNCTION>" (2)** to get to the printer setup page **(3).**
2. Use the up/down arrow-keys on the MCDU to scroll through the list.
3. Select the desired printing device **(4)**.







PRINTOUT CUSTOMISATION

Page 2/4 of the 'Print Function' menu allows for printout layout customisation. Choose a preset or customise margins and size according to your printer device.

AUTO PRINT

Pages 3 and 4 allow for the selection of messages to be printed automatically.

5. USING THE A320-X

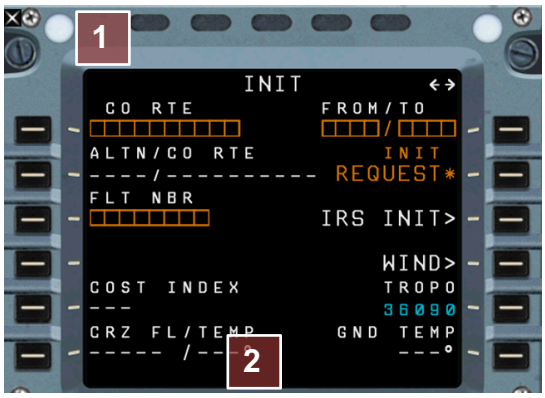
Saving and Loading Flights

The A320-X will save the current panel state whenever you save a flight. If you then reload a saved flight, the panel state at the time of the save will load along with it. This is possible on both ground as well as while airborne.

MCDU Physical Keyboard Entry

Text can be entered into the MCDU by using your PC's hardware keyboard. To enable the keyboard entry method, click the white dot at the top left of the MCDU (**1**). The white dot will turn yellow, which enables you to write into the scratchpad (**2**) using your physical keyboard.

Click the same (now yellow) dot again to disable keyboard entry.



Mouse Button Usage

In order to provide for easy manipulation of the many pushbuttons, rotating switches and handles you will find in the A320-X's panels, the mouse handling has received some changes compared to the default P3D aircraft.

LEFT / RIGHT

Knobs which allow to be rotated to the left and right, can be moved accordingly using the left / right mouse buttons or the scroll wheel.

Knobs that can be rotated AND pushed or pulled, have dedicated clickspots to allow rotating them left or right with mouse button clicks using the 2D panel. However, these clickspots are not available in the Virtual Cockpit. In VC mode these knobs can only be rotated using the scroll wheel.

PUSH / PULL

Whenever a knob can be pushed or pulled, pushing is always accomplished with a left-click, and pulling with a right-click.

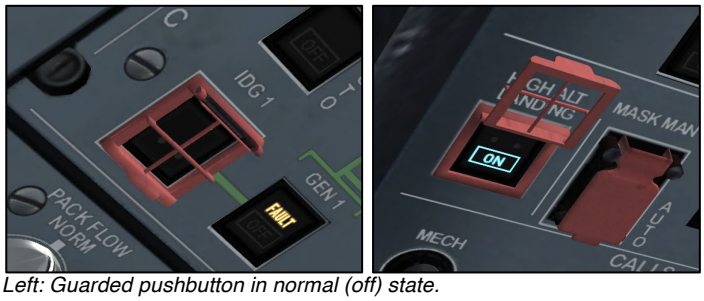
LIFT / MOVE

Certain switches need to be lifted before they can be moved to a different position. This is done to prevent unintentional movement by accidently hitting the switch. One example is the two fuel cutoff switches, one for each engine.

To move these switches, right-click to lift the guard first (and keep the mouse button pressed), then left-click to move it.

GUARDED PUSHBUTTON SWITCH

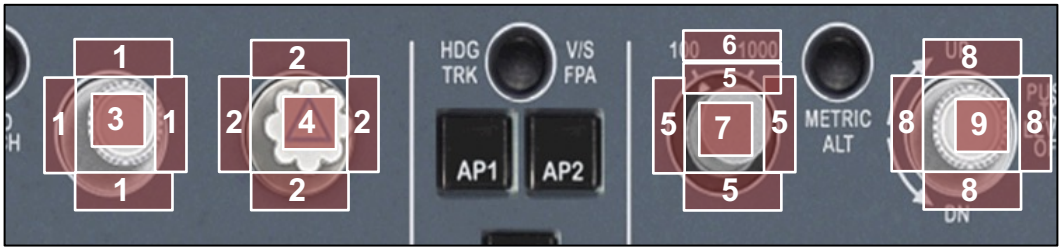
Certain switches have protective covers to prevent them from being accidentally pressed. These are referred to as *guarded* switches. In order to access these switches, the guards must first be lifted up out of the way.
First click and hold the guard with your right mouse button. While continuing to hold the right button, click once with the left mouse button. The guard will move back to its original position as soon as the right mouse button is released.



Left: Guarded pushbutton in normal (off) state.
Right: Guarded pushbutton with the guard lifted and the button pressed.

FLIGHT CONTROL UNIT (FCU) – 2D PANEL

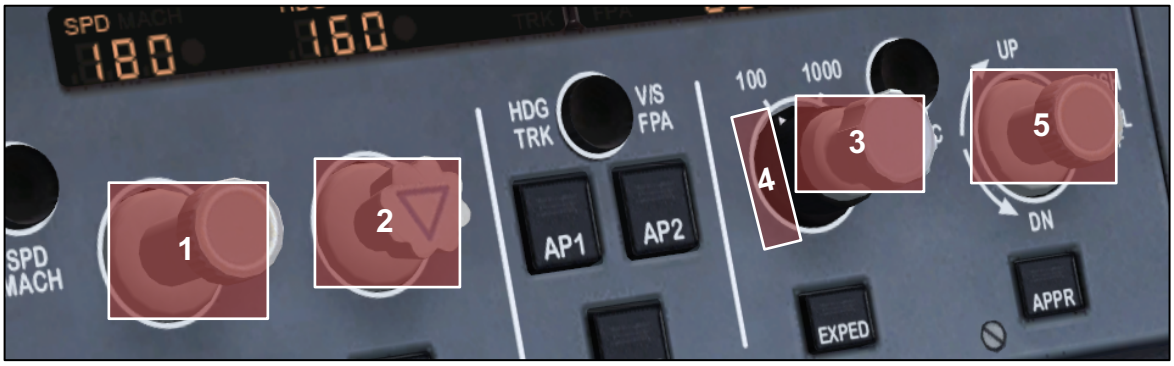
There are four large rotating knobs, or "selectors" as they are also called, on the A320's Flight Control Unit (FCU) that are used to manually select or change the aircraft's speed, heading, altitude and vertical speed. FSLabs have designed specific mouse actions which allow you to easily manipulate these selectors for efficient use during the flight. In the figure below, the numbered red boxes show the various mouse click areas around the selectors.



(1) Select speed by rotating the selector with left or right click, or using the mouse wheel
(2) Select heading by rotating the selector with left- or right-click, or using the mouse wheel
(3) Selected speed: Right-click to pull the selector.
Managed speed: Left-click to push the selector.
(4) Select heading mode: Right-click to pull
Select NAV mode: Left-click to push to follow the flightplan.
(5) Select altitude by rotating the selector with left or right click, or by using the mouse wheel.
(6) Right or left click to switch between 100ft and 1000ft altitude increments.
(7) Select open climb/descend:
Right-click to pull the selector.
Select managed climb/descend:
Left-click to push the selector.
(8) Select vertical speed by rotating the selector with left- or right-click, or by using the mouse wheel
(9) Select vertical speed mode:
Right-click to pull the selector.
Select level-off:
Left-click to push the selector and level-off the aircraft.

FLIGHT CONTROL UNIT (FCU) – VIRTUAL COCKPIT

While the function of the selectors is the same as in the 2D cockpit, the mouse actions are slightly different. You must use the mouse wheel in the Virtual Cockpit to rotate the selectors (i.e. left and right clicking will not rotate the selector). In the figure below, the numbered red boxes show the various mouse areas around the selectors.



(1) Select speed by rotating the selector using the mouse wheel.
Selected speed mode:
Right click to pull the selector.
Managed speed mode:
Left click to push the selector.
(2) Select heading by rotating the selector using the mouse wheel.
Select heading mode: Right click to pull the selector.
Select NAV mode: Left click to push the selector.
(3) Select altitude by rotating the selector using the mouse wheel.
Select open climb/descend:
Right click to pull the selector.
Select managed climb/descend:
Left click to push the selector.
(4) Right or left click the outer ring of the selector to switch between 100ft and 1000ft altitude increments.
(5) Select vertical speed by rotating the selector using the mouse wheel.
Select vertical speed mode:
Right click to pull the selector.
Select level-off:
Left click to push the selector and level-off the aircraft.

2D-Panel Navigation

The main 2D-panel provides various mouse click-spots for easy access to sub-panels. Some of these click-spots have different actions for the left and right mouse buttons. All of the sub-panels, once opened, may be undocked and moved around the screen and/or to additional monitors.



(1) Left-click to open the overhead panel.
(2) Left-click to open the left (Captain's) MCDU.
Right-click to open the right (First Officer's) MCDU.
(3) Left-click to open the centre pedestal.
(4) Left-click to open the lower ECAM display and the ECAM control panel.
(5) Left-click to open the upper gear panel and the clock.
Right-click to open the entire gear panel.
(6) Left-click to move the entire panel upwards.
(7) Left-click to switch to the F/O panel.
(8) Left-click to enlarge the display.

CLOSING A POP-UP PANEL



Find the X-symbol on any pop-up panel to close it.

Thrust Lever Operation

The thrust levers are the main interface between the Flight Management Guidance Computer (FMGC), the Full Authority Digital Engine Control System (FADEC) and the flight crew.

The A320 provides two thrust levers to control engine thrust, one per engine, as any other twin-engine aircraft. The range goes from full reverse thrust to maximum take-off thrust.
In addition, the A320's thrust levers feature various thrust "detents". A detent is a pre-set position along the thrust lever's movement range that sets a particular thrust during a specific phase or condition of flight. The flight crew interacts with the A320's auto thrust system by moving the thrust levers through the various detents.

WHAT ARE THESE DETENTS?

The following detents are available:

Go Around / Max T.O. (TOGA) – (1)
This thrust setting commands maximum go around or take-off power at all times.

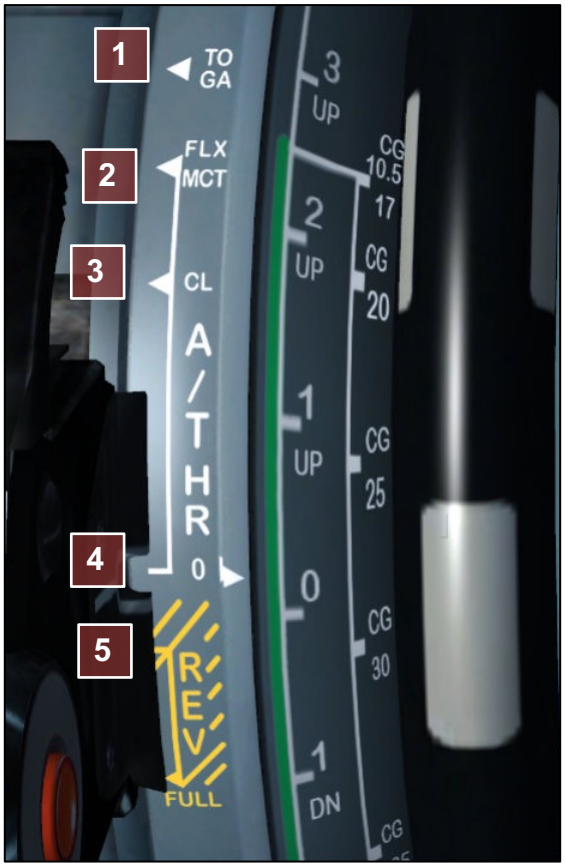
Max Cont (MCT) / Flex T.O. (FLX) – (2)
The flex setting is used for reduced thrust take-off, called flex take-off (FLX). When airborne this setting is also used in case of a one-engine-out situation to get the maximum thrust allowed for the remaining engine during climb and cruise (MCT).

Max Climb (CL) – (3)
This is the climb thrust setting. The thrust levers remain in this detent during the entire flight under normal conditions, whenever the autothrust system commands thrust and the flight crew does not need to interfere with auto thrust system.

Idle Thrust (0) – (4)
The auto thrust system is ALWAYS disconnected when the thrust levers are moved into the idle detent.

Rev Idle (REV) – (5)
Reverse doors open with the engines at idle thrust. If in landing phase, this will also extend ground spoilers if they have not been armed before touchdown.

Note: There is a maximum reverse setting, but this is simply the physical stop for the thrust levers. This commands maximum reverse thrust only without any other system connections.



ADJUSTING THRUST USING A HARDWARE THROTTLE LEVER (JOYSTICK)

Using a USB joystick lever to control thrust, the thrust levers will move through the entire thrust range including the thrust detents. Each detent will be clearly audible as soon as the levers snap into it.

If you wish to use one joystick lever per engine or use the same axis to control reverse thrust, adjust the thrust lever settings as described in chapter 3.

ADJUSTING THRUST USING THE KEYBOARD

You may also use your keyboard to move the thrust levers, utilising the F1 – F4 keys.

- **F1** and **F4**: Use these two keys to move the thrust levers from one detent to the next
- **F2** and **F3**: Use these two keys to move the thrust levers between the detents.

Example: For take-off press F3 repeatedly to move the thrust levers to 50% N1. When the engines have stabilised, press F4 twice to move the levers to the FLX detent for a reduced thrust take-off.

Failure Simulation

The A320-X offers the possibility to experience and deal with system failures in various system categories. This chapter describes how they can be armed or activated. Failures will not take place unless you specifically activate them. The A320 will perform flawlessly unless and until you decide to allow for failures to take place via the MCDU.

To access the failure menu:

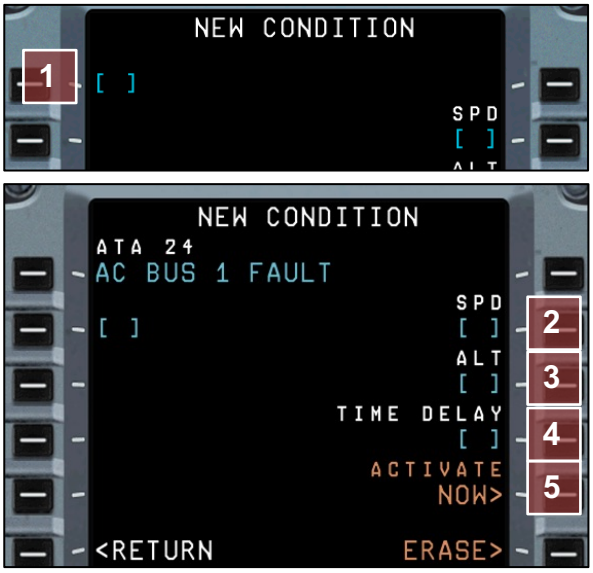
1. **On the MCDU press the 'MCDU MENU' button.**
2. **Select 'FAILURES>' using the LSK 4R.**
3. The MCDU then let's you choose to list the armed failures, as well as the already active ones. The latter obviously shows nothing if you haven't set any failures.

CREATE A NEW SYSTEM FAILURE

Once you are in the MCDU failure menu:

1. **Select '<ARMED' to create a new failure condition.**
2. **Since there's no armed failure present, the MCDU will automatically present to the 'New Condition'-page.**

From this page, you can set a new failure and its activation conditions:



- First, select the empty brackets on the left with the LSK 1L to get a list of available failures **(1)**.
- Next, choose one or more of the conditions for this failure to activate:
  - SPD **(2)** – Enter a value for knots IAS. Precede the value with a + symbol to create "at or above", or a – symbol for "at or below".
    Valid range: 0 -399 (kts)
  - ALT **(3)** – Enter a value for altitude in feet MSL. Precede the value with a + symbol to create "at or above", or a – symbol for "at or below".
    Valid range: 0 – 41000 (ft)
  - TIME DELAY **(4)** – Enter a value for seconds. Precede the value with a + symbol to create "at or after", or a – symbol for "at or before".
    Valid range: 0 – 3600000 (seconds)
- Hit '**INSERT***' to add this failure to the 'ARMED' list.
- Or hit 'ACTIVATE NOW' **(5)** to immediately activate the selected failure.

Further options:

- You can also create a random time at which the failure will occur by inserting a time delay condition. To do this, use the 'OVFY'-key (located at the bottom right of the MCDU keyboard) to insert the OVFY-symbol instead of a number value. This will create a random time delay between 0 seconds and 8 hours at which the failure will be triggered.
- The systems are categorised using the industry standard ATA numbering system. You may enter a chapter number into the empty brackets on the left side, which will display just the failures for that chapter.
- Up to 5 failures can be associated with each condition or set of conditions.
- If you wish to get a randomly chosen system to fail with the condition you set, you may do so by placing the 'OVFY'-symbol into the empty brackets on the left side. This will then display as 'RANDOM FAILURE'.
- Use the 'OVFLY'-symbol followed by any number from 1 to 5 to choose the number of random systems to fail.
- You may also choose a random system within a specific chapter by specifying the ATA chapter number:

  Example: **Δ2ATA 24**
  This will choose 2 random systems within the electrical power category (ATA24). Note that there is a space required before the chapter number.

CLEARING A FAILURE

- To clear an armed or an active failure, display either the armed or active list and use the ‘CLR’-button to delete the desired failure.
- A ‘CLEAR ALL’ command is provided to clear all failures on the armed OR active list.

DEALING WITH A SYSTEM FAILURE

The A320 provides for a convenient method to work through system failures. “ECAM Action” messages are shown on the upper ECAM display when a system failure occurs. These procedures allow for troubleshooting the problem.



(1) All fault messages are displayed on this part of the upper ECAM display. It contains the fault message itself in amber followed by a list of immediate actions to perform in blue. If there are multiple faults, each one will have its own section listing the fault and the action list.

(2) This section shows a summary of the system categories affected by the fault.

(3) On the right side of the “Status” page (on the lower ECAM display), you will find a list of all inoperative systems.

(4) On the left side of the Status page, a list appears which advises you of actions which should be taken and any consequences resulting from inoperative systems.

(5) The ECAM Control Panel (ECP) is used to switch between system pages and to work through the system failures:

STS – Press this button to access the Status-Page.

CLR – Press the clear-button to clear a fault message and proceed to the next one(if there are multiple faults).

Doors / Slides

You may wish to open or close cabin or cargo doors.
Select 'DOORS>' on the MCDU option page to get to the door control options.

Note: The blue text below the door label always describes the action after the key next to it is pressed. This means if the blue text says "OPEN", then the door is currently closed and vice versa.

EVACUATION SLIDES ARM/DISARM

In order to give the cabin crew a command to arm or disarm the slides, press and hold the 'PA'-button on the ACP (Audio Control Panel) for approx. 4 seconds – as if you were saying "Cabin crew doors to automatic/manual and crosscheck".

GSX Automated Fuel/Payload/Ground Service Management

The use of GSX has been fully integrated into the workflows of the A320X. For normal operations, manually opening the GSX menu is not needed.

GSX GROUND SERVICE

The following services are handled automatically by GSX when using the A320X:

- Setting wheel chocks
- Disconnecting or connecting a jetway before departure or after shutdown
- Connecting external power
- Usage of the nosewheel steering pin
- Opening and closing all necessary doors before and after a flight

Loading a new scenario
When loading a new scenario in P3D and you would like to have a jetway or stairs connected to your aircraft:

- Flicking the INT/RAD switch on the Audio Control Panel to 'INT' with external or APU power connected will trigger GSX to perform a de-boarding.

This is the only way to activate GSX before calling any services for departure flight preparation. However, if you load the aircraft using a panel state with an empty cabin, de-boarding will be completed rapidly, and jetways/stairs will remain in place.

Getting ready for start-up/pushback
When boarding is complete, your crew will close the 1L door on their own. To advise the ground crew afterwards that you'd like to get ready for start-up/pushback:

- Flicking the INT/RAD switch on the Audio Control Panel to 'INT' triggers GSX to prepare for pushback or start-up.

Make sure that APU power is available when you do this, as the ground crew will remove external power.
GSX will also ask you if de-icing is needed, should there be icing conditions present.

Receiving ground service after shutdown
Upon arrival at the gate, GSX will provide you automatically with the necessary ground power, stairs and jetways. Cabin crew will open the doors so that de-boarding can start. Ground crew will approach the aircraft:

- After engine shutdown, and the beacon lights being turned off, GSX will be triggered to do de-boarding.
- GSX V2 will send the crew bus only if it has been requested via the AOC menu page while inflight.

GSX REFUELLING

GSX refuelling will be triggered automatically when the proper messages are sent by datalink (ATSU). After confirming the fuel requirements on the ATSU's OFP DATA page, that data is then being sent off to the refuelling operator. Having received that fuel order, the fuel company will dispatch its operator to your aircraft, which is accomplished by automatically triggering the refuelling option in GSX.

GSX PAYLOAD MANAGEMENT

GSX will automatically load the correct number of passengers and amount of cargo to result in the planned Zero Fuel Weight. The data for this is the flight plan (OFP) being downloaded to the aircraft via datalink. Note that the amount of cargo and passengers will vary according to the type of flight you are doing.
Catering and water are also ordered using the message being sent via datalink. This will trigger GSX to send the catering vehicles.

ATSU / Datalink

ATSU stands for Air Traffic Service Unit and provides data communication between aircraft, air traffic control and the airline. It facilitates flight- and weather data exchange, reports to ground services and messages to air traffic control. This greatly simplifies data exchange and reduces the amount of paper work to be completed for each flight.
Within ATSU we have modelled the AOC functionality. AOC stands for Airline Operational Control and is basically providing the functions for flight preparation. The other part of ATSU would be the ATC functionality, required for the exchange of ATC instructions and requests. The ATC menu is not modelled.
However, since the AOC part contains a small portion of the ATC communication functionality, a connection to an online ATC network such as VATSIM or IVAO is needed for this. However, most of the AOC functions can be used in any normal offline flight.

FEATURES AVAILABLE

Flight Sim Labs' ATSU functionality features an extensive array of services to take immersion to an even higher level by allowing to experience the full extent of flight preparations in a modern datalink equipped flight deck.

- **OFP Download** - Load Operation Flight Plan data into the FMGC and its linked AOC pages. This data not only contains the flightplan route, but also payload and schedule information and more. This data is used to provide you with slot information.
- **Load sheet information download** - With payload and flightplan data being send to and from the airline, the aircraft's load sheet is sent to the aircraft by ground handling. This can then be used to feed weight and load information into the FMGC.

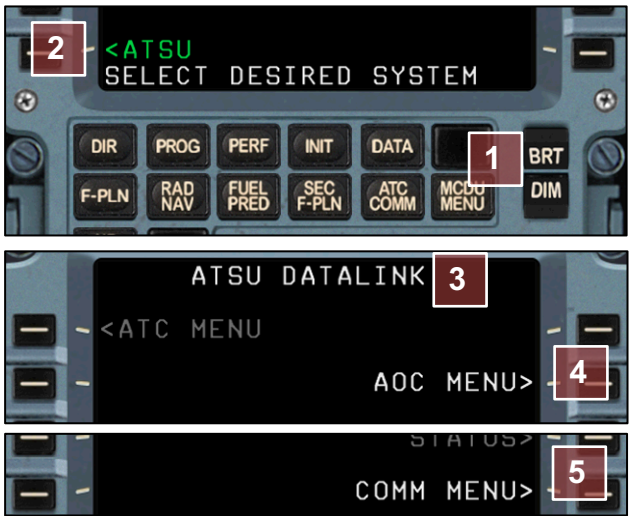
  The load sheet information is dynamic and different according to the type of flight conducted. Furthermore, realistic variance in payload is simulated, which in turn may require a load sheet revision.
- **Weather information download** - Winds, ATIS, METAR, SIGMET and forecast data.
- **Performance data exchange** - This allows for the airline's computers to work out the take-off performance data and send it back to the aircraft.
- **ATC departure clearance** - Ask for and receive the pre-departure clearance (PDC) from ATC.
- **Print messages and data** - Any printer registered in Windows can be used to simulate the onboard printer. Weather data, performance data or company messages can be printed manually or automatically. If printing is not desired, all messages can be read on the MCDU as well.
- **Fuel reports** - Exchange refuelling information and fuel reports with ground handling.
- **Gate information** - Receive a company message before arrival, informing you about the gate assignment at the arrival airport.

For more information on how to use ATSU, see the tutorial document "A320-X ATSU Tutorial".

ATSU SYSTEM ACCESS

The ATSU functions can be accessed via the MCDU main menu.

4. On the MCDU **press the "MCDU MENU" button (1), then "<ATSU" (2)** to get the ATSU page **(3)**:
5. Press "AOC MENU>" **(4)** to access the AOC functionality.



The COMM menu **(5)** is used for datalink configuration options. See below for details.

CONFIGURATION OPTIONS - COMM

The COMM menu, accessed via the ATSU prompt from the MCDU Menu, provides some configuration possibilities:

VHF 3 Data Mode

This page specifies data providers.

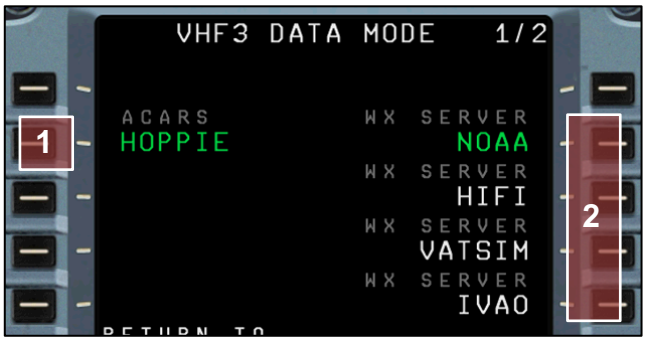
ACARS – (1)
Select the ACARS network being used. At this time Hoppie is the only ACARS network available.

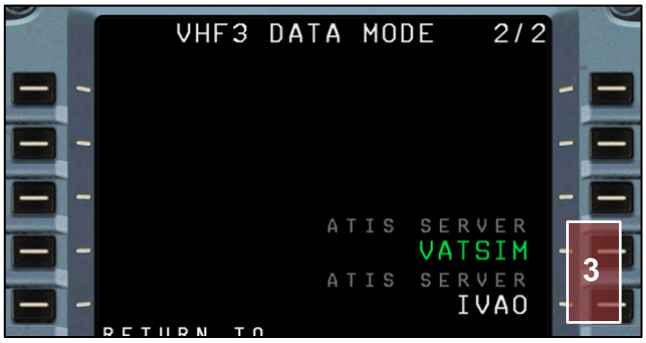
WX Server – (2)
Select the weather data source you wish to use:

- **NOAA** – National Oceanic and Atmospheric Administration
- **HIFI** – Active Sky weather
- **VATSIM** – VATSIM's own weather
- **IVAO** – IVAO's own weather

Important If you use ActiveSky in historical weather mode, make sure that the weather source is set to 'HIFI', as the NOAA weather will always be real-time.

ATIS Server – (3)
Select the ATIS data source you wish to use. To receive ATIS data, you need to be connected to one of these online ATC networks.





ATC Online List

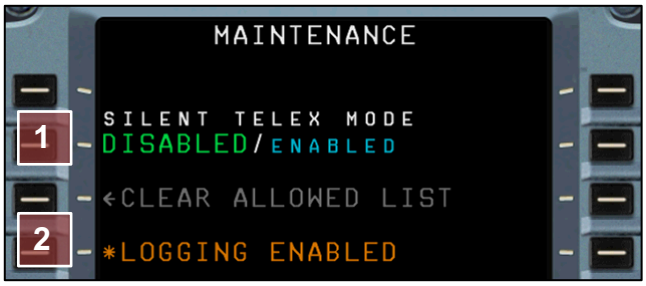
ATC Stations Online – (1)
Shows all ATC stations that are logged on with the Hoppie ACARS network. Datalink messages can be sent to these stations.



Maintenance

Silent Telex Mode – (1)
When enabled, will only receive TELEX messages from stations that have been sent a message from the aircraft. This feature was implemented to prevent unwanted messages being displayed. To add a station to the 'allowed list' - a message must be sent to that station using the FREETEXT page.

Logging – (2)
Enable or disable ATSU function logging. This is used for support issues only.



AOC PAGES

AOC Menu Page

This is the main menu page for all AOC related functions. The following sub-pages are available:

AOC Initialisation (INIT) – (1)
Initialisation of the datalink system for each flight, as well as flight data review to be exchanged with the airline.

OFP Data – (2)
Entry of flight plan weight and fuel data.

ATC Request (ATC REQ) – (3)
ATC departure clearance via datalink (requires online ATC connection).

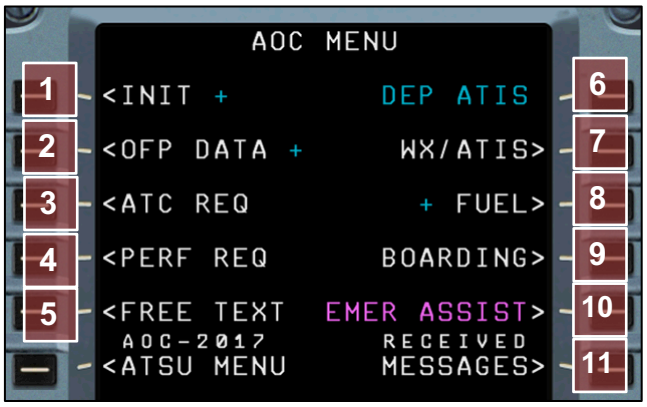
Performance Request (PERF REQ) – (4)
Remote take-off data calculation, resulting in a company message containing take-off performance data.

Free Text – (5)
Send free text messages to any station on the ACARS network, such as ATC units or other aircraft.

ATIS – (6)
Requests departure or arrival ATIS data, if the station is online (VATSIM or IAVO). DEP ATIS is available only on ground.

Weather / ATIS (WX/ATIS) – (7)
Download weather information, such as METAR, SIGMET, forecast or ATIS.

Fuel – (8)
Fuel report uplink page from supplier.



Boarding – (9)
Send PAX and cargo data to your handling agent, and request services for loading the aircraft.

Emergency Assistance (EMER ASSIST) – (10)
Send messages in case of an emergency that needs assistance from the ground, for which details need to be provided.
Note: While you can type and send those messages, at present they do not offer any other functionality.

Received Messages – (11)
Access all received messages.

While airborne

Note that the AOC menu page shows an option to request the **crew bus** once inflight. This will tell GSX V2 to send the crew bus and have the crew deboard.
If you don't make a request, a turnaround is assumed.

AOC INIT 1/2

The first AOC INIT page is used to initialise a flight and is the basis for all following steps with the ATSU system.

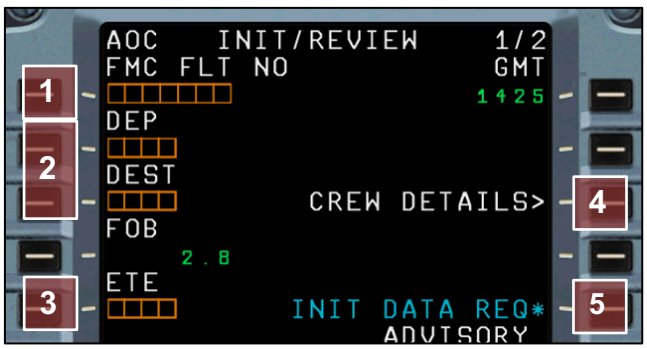
FMC FLT NO – (1)
The flight number in either ICAO or IATA format.

DEP / DEST – (2)
Point of departure and destination ICAO code. Auto-populated with data from FMGC INIT A page.

Estimated Time Enroute – (3)
Calculated time enroute, which is indicated on your flightplan, and is filled in automatically after initialising the AOC via INIT DATA REQ*

Crew Details – (4)
Specify crew details. The page allows for insertion of the crew's ID numbers. Entering the captain's and first officer's ID number will later allow you to specify the landing pilot.

Note: Airlines use many different formats, like an alphanumeric combination, some use their staff ID. If flying online you could for example use your ID from VATSIM, IVAO etc or your ID from your Virtual Airline.



Note: Some items get filled in automatically after a Operational Flight Plan has been downloaded into the FMGC.

INIT Data Request – (5)
Send the filled in data to the airline, to receive data for the flight specified. This resets all parameters in the AOC unit and auto-populates the AOC OFP DATA page if an OFP was uplinked through FMGC INIT A.

AOC INIT 2/2

The second AOC INIT page is used to review a flight and needs to be sent to the airline after arriving at the destination gate. All time stamps get filled in automatically by the system as the flight progresses.

Off-Block time (OUT) – (1)
Time of brake release for pushback or taxi out.

Doors closure (DOORS) – (2)
The time when all doors got closed.

Take-Off time (OFF) – (3)
Time of lift-off.

Landing time (ON) – (4)
Time of touch-down.

On-Block time (IN) – (5)
Populated when the first door opens and shows the time the parking brake was last set.

Block time – (6)
The time between brake release at the point of departure and shutting down at the destination gate.

Flight time – (7)
Airborne time.



Landing pilot – (8)
Specify if captain or first officer has performed the landing.

Autoland – (9)
Specify whether or not an autoland had been conducted.

OFP DATA

The OFP Data page is used to send fuel and weight numbers to the ground handling stations. All numbers are imported from the OFP downloaded into the FMGC.

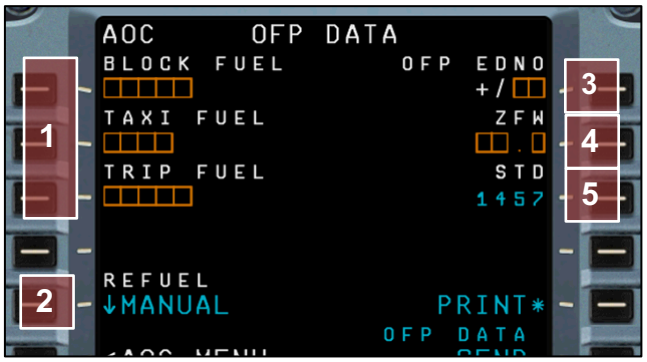
Sending off this data gives the fuel operators access to the required fuel for the flight.

Fuel – (1)
Block-, taxi- and trip fuel as indicated on your flightplan.

Refuelling method – (2)
This option is not present on the real aircraft and is used to set the desired method of refuelling. The following options are available:

- **Manual** – Use either the refuelling panel to fuel the aircraft manually, or the MCDU option fuel page to adjust the fuel load.
- **Automatic** – Simulating the aircraft being refuelled using a realistic time required to complete the process.
- **GSX** – GSX will be used to handle the refuelling process, sending its fuel vehicle to realistically handle the process.
- **Instant** – Instantly fills the tanks with the ordered amount of fuel.

OFP edition number (OFP EDNO) – (3)
The revision number of the OFP used. Usually this is number 01 if it is the first revision of an OFP.



Zero Fuel Weight (ZFW) – (4)
Zero Fuel Weight from the OFP.

Scheduled time of departure (STD) – (5)
Schedule Time of Departure, taken from the flight plan (UTC). This time is auto-populated from OFP DATA uplink. If the flight simulator date and time is not within 1 hour of the STD, this time will be amber. It can be auto-populated to the current simulator date and time + 32mins pressing CLR then LSK 3R.

Note: If GSX is used, sending the OFP data will trigger GSX to start the refuelling process. No manual interaction is required.

ATC REQ

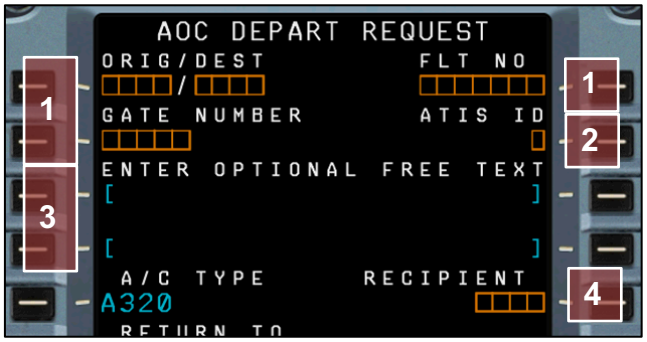
The ATC Request pages are used to ask for ATC clearances. Either departure or oceanic clearance is available. This requires a response from an air traffic controller connected to your online ATC network.

Flight data – (1)
Departure and destination aerodrome as well as the gate- and flight numbers are needed.

ATIS ID – (2)
The identification letter of the ATIS info you have received.

Free text – (3)
Add any free text desired for the air traffic controller to see when dealing with your request.

Recipient station ID – (4)
The ID of the station the request is going to be sent to. Usually this is the ICAO code of your departure aerodrome.

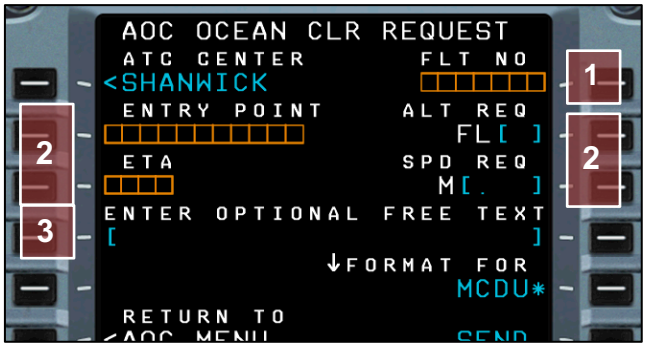


Note: In case a controller on the network is handling the airspace in the area but not any specific aerodrome, the request can also be sent to the FIR identifier.

Flight number – (1)
Flight number in ICAO format.

Desired entry point data – (2)
Data for the planned oceanic entry point: Name of the point, as well as ETA, flight level and the Mach number desired.

Free text – (3)
Add any free text desired for the air traffic controller to see when dealing with your request.



PERF REQ

The performance request page is used to obtain take-off performance data. Sending off the filled-in data will get the calculation going on the airline's computer, which then sends back the results to be filled into the FMGC take-off PERF page.

Aerodrome data – (1)
Departure aerodrome ICAO code and take-off runway.

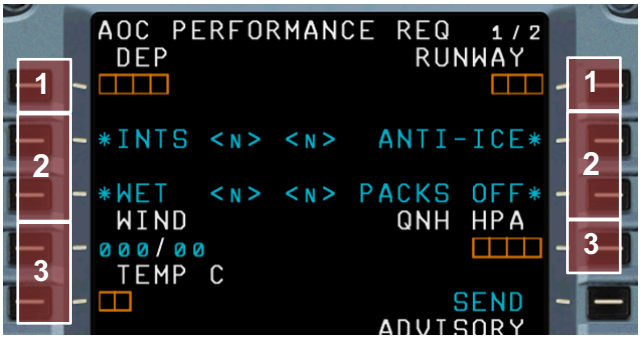
Options affecting take-off performance – (2)
Select any of the available options:

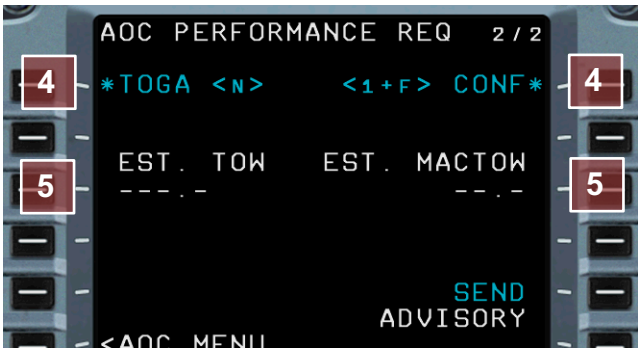
- **INTS** – Select yes if you want to have intersection departure data calculated.
- **WET** – Select yes if the runway condition is reported wet.
- **ANTI**-ICE – Select yes if anti-ice is going to be used during the take-off phase.
- **PACKS OFF** – Select yes if you depart with packs switched off.

Weather data – (3)
Fill in the weather data obtained from the ATIS.

Thrust / Flaps options – (4)
Option to use TOGA thrust for calculation, as well as flaps config option (1+F, 2 or 3).

Weight / Centre of Gravity – (5)
Enter the estimated take-off weight and MACTOW (centre of gravity at take-off weight).





Note: Weight information can be taken from the prelim. load sheet received via datalink.

ATIS/WX

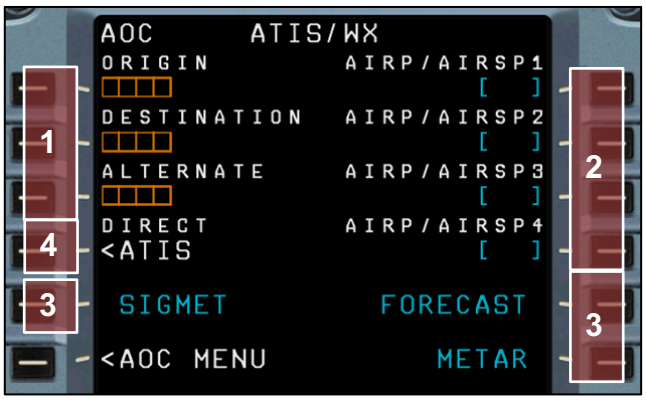
The ATIS / Weather page allows for weather data to be retrieved from ATC and weather providers.
Available weather data: ATIS, SIGMET, Forecast and METAR.

Aerodrome data – (1)
Departure, destination and alternate aerodrome ICAO codes. These are automatically populated from the FMGC INIT A page.

Additional airports / airspaces – (2)
These fields overwrite the defaults and are used to retrieve custom airfield weather, or SIGMETS for specific FIR regions.

Request data – (3)
Having chosen airports / airspaces above, press any of these options to request SIGMET, forecast or METAR data. Selecting any of these options will send out the request immediately, they cannot be grouped together.

ATIS – (4)
Access to the ATIS request page (see below).



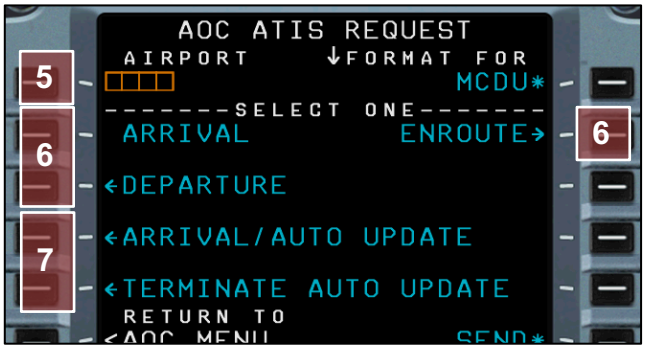
Note: SIGMET and Forecast data is only available if the weather source is set to NOAA. In case you wish to use historical weather, you need to look for that data within the flight planning tool.

ATIS Request page
Request ATIS data for arrival-, departure- and enroute ATIS information.

Aerodrome code – (5)
Specify the airport code.

ATIS type – (6)
Select whether you want to receive arrival-, departure- or enroute ATIS information.

Auto Update – (7)
Begins an auto-update contract with the ATIS station. A new company message will be received anytime the ATIS station updates. Any number of stations can be added at any one time. The contracts only last for 1 hour. They can be terminated at any time by sending a TERMINATE message to the station.



Note: For ATIS to be available via datalink, an active connection to an online ATC network must be established. Furthermore, there needs to be an active ATIS on the airports you intend to receive data from.
Use the VHF ATIS frequency to obtain ATIS information for offline flights.

FUEL

This page is used to send a fuel report to the airline. Once refuelling is complete, the fuel company will uplink the data and you can send the report by confirming the amount of fuel taken during the process. If you forget to send the report, expect to receive a company message later in the flight to remind you to send one.

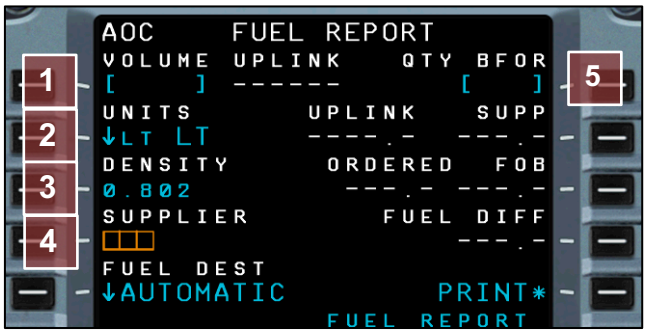
Fuel amount confirmation – (1)
Enter the amount of fuel received from the refuelling company. Note that this needs to be provided as volume, not weight.

Fuel volume unit – (2)
Choose between litres and gallons.

Fuel density – (3)
Density of the supplied fuel.

Fuel company – (4)
Specifies the fuel supplier. Linked to GSX if installed.

Fuel quantity before refuelling – (5)
FOB before the refuelling started. Specified in KG or LBS.



BOARDING

The boarding page serves as an interface to ground handling agents, giving them the possibility to provide compartment loading information, and for the flight crew to let them know about your boarding, catering and servicing requirements.

Zero Fuel Weight – (1)
Your zero fuel weight as calculated by dispatch.

Cargo compartment load – (2)
Cargo weight distributed to the different compartments.

Crew – (3)
Number of flight- and cabin crew.

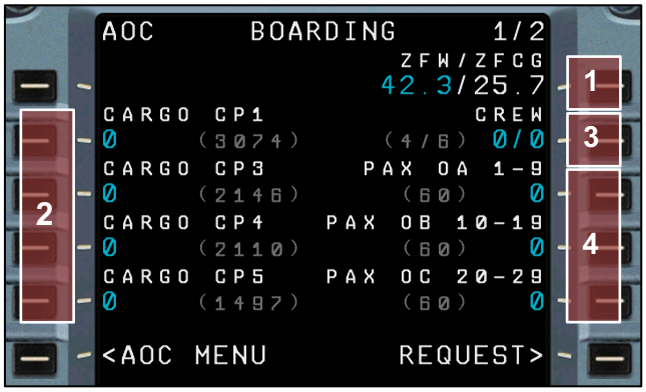
Passenger compartment load – (4)
Number of passengers distributed to the different compartments.

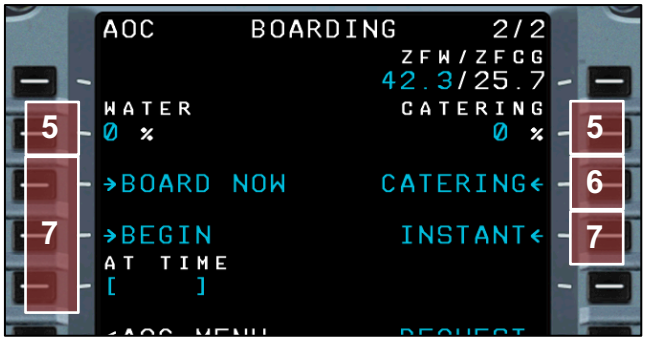
Water / Catering – (5)
Percentage for water and catering to order from the catering supplier.

Catering request – (6)
Select this option, then 'REQUEST' to order catering to be delivered.

Boarding start – (7)
Various options to have boarding started or load the payload immediately:

- **BOARD NOW** – Sends a message to ground handling to start boarding.
- **BEGIN AT TIME** – Select a time (UTC) at which you want the boarding to be started.
- **INSTANT** – This option, obviously not present in the real aircraft, instantly loads the specified cargo and passengers.





FREE TEXT

You may send a free text message to any entity on the datalink network. Within Prepar3D this means messages can be sent to another aircraft, or to an ATC station.

Message recipient – (1)
Enter the identifier of the recipient. This can be a flight number for example, enabling you to reach another aircraft.

Message content – (2)
Lines available to be filled with text. Use the up/down scroll buttons to populate more lines of text

Message summary – (3)
The summary page will display the entire message draft, with the possibility to edit, accept and send the message.



EMER ASSIST

Send messages to the proper ground stations in case of an emergency. Options available are:

- Fire & Rescue
- Medical assistance
- Reports for smell

Note: A response to these messages is not simulated.

RECEIVED MESSAGES

Provides a list of all messages received. New messages are presented in a slightly larger font and are marked as "NEW". Loadsheet messages are marked with 'A' for Acknowledged.

WIND DATA DOWNLOAD

Wind data request via datalink is functional in the FSLabs A320-X when P3D is run in conjunction with ActiveSky by HiFi-Sim. For more information including buying options, please go to the HiFi Sim website at: www.hifisimtech.com

Accessed via the FMGC's INIT page, the A320-X allows for wind data to be downloaded via datalink. If wind data is requested, data will arrive within a few minutes after the request and will be filled in automatically for the entire flight plan.

Wind Request – (1)
Sends a request for wind data to be sent to the aircraft.

History Wind – (2)
If updated wind data is not available for a return flight, history wind data could be used, taking recorded wind information from the previous flight.

Flight Phase Selection – (3)
Switch between climb, cruise and descent phase to view its data.

Selected Waypoint – (4)
In the cruise phase, use the MCDU's arrow keys to cycle through all available cruise waypoints.

Wind Data – (5)
Wind data is always available at several different flight levels for each waypoint.

Note: Make sure to load or construct the entire flight plan before requesting wind data.



Weather Radar

Like wind data request, weather radar also requires ActiveSky to be used in conjunction with P3D.

When coupled with ActiveSky, the A320-X will display weather radar returns on its Navigation Display indicating precipitation intensity. The radar will also provide you with information on turbulence as well as predictive wind shear avoidance. The radar system can be adjusted for Gain (sensitivity) as well as Tilt (position of the radar antenna up or down).

The weather radar panel is located on the centre pedestal right next to the captain's seat. It offers the following settings:

SYS – (1)
Turns on the radar by moving the switch to either position 1 or 2.

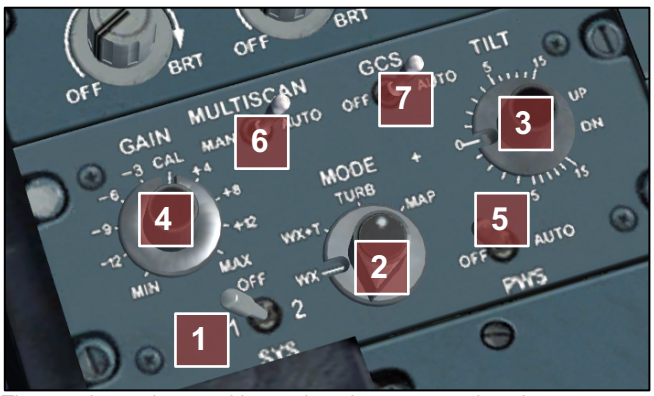
MODE – (2)
Selects the mode of operation:

WX – Displays precipitation information
WX+T – Displays precipitation and turbulence information
TURB – Displays turbulence areas only
MAP – Ground mapping function *(not implemented)*

TILT – (3)
Adjusts the radar antenna's tilt.

GAIN – (4)
Adjusts the receiver's sensitivity.

PWS – (5)
Activates the Predictive Windshear System.



The weather radar panel located on the centre pedestal.

MULTISCAN – (6)
When set to AUTO the radar will adjust gain and tilt automatically. With this setting the GAIN and TILT selectors have no effect.

GCS – (7)
Turns ground clutter suppression off or sets it to auto.
(not implemented)

Walk-Around

While it is unnecessary to perform a walk around as the types of abnormal conditions a pilot is looking for are not simulated, if you decide to venture outside the aircraft before the flight, you will discover more of the depth of the FSLabs A320-X's external visual and aural modelling.

TEXT LABELS

All text labels on the outside of the aircraft are designed to be legible from various distances. You will find accurate labelling around equipment, on access panels, on nose wheel and cargo doors and engines.



Text detail on the engine cowling doors and nose wheel.

SOUNDS

The FSLabs A320-X provides an innovative 3D sound design that lets you experience sounds spatially. This means that how you hear various sounds will be dependent on what your proximity is to those sounds. For example, the sound of a running APU will be much louder if you are underneath the A320-X's tail than it will be under the nose. As you move left and right or front and back from the source, the sound will change. This is so realistic that if you have the brake fans running while checking the main gear, you will wish you had brought ear protection!
This aural experience is also carried into the cabin. Sounds will be heard wherever they are audible in the real aircraft. You may also want to configure the audio control panel on the flight deck to listen to the cabin intercom.

Payload Settings

This option page allows for instant adjustment of the aircraft's payload, by either adjusting the ZFW entry, or by making separate adjustments for each cabin section and cargo compartment.

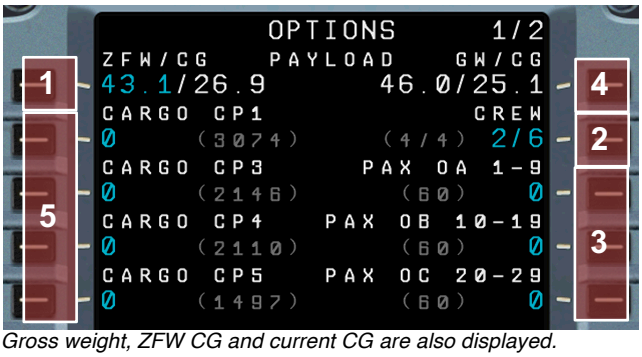
The following functions are available:

Zero Fuel Weight (ZFW) – (1)
Set the desired ZFW. The load will be distributed automatically.

Crew Complement – (2)
Sets the number of crewmembers. 2 is the minimum value.

Passenger Compartments – (3)
The total number of passengers is 168.

GW/CG – (4)
Displays gross weight and current Centre of Gravity (CG). The CG is calculated by the FMGC by utilising the fuel load and payload distribution.



Gross weight, ZFW CG and current CG are also displayed.

Cargo Compartments – (5)
For cargo loading the A320 features 4 compartments. CP1 is located forward of the wing while CP3, 4 and 5 are located aft of the wing.

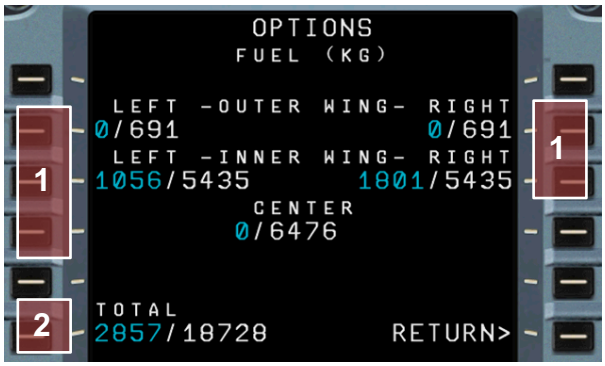
Fuel Load Settings

VIA MCDU PAGE

The fastest way to change the fuel load is by using the refuelling options page in the MCDU.

You may set any desired fuel amount, either by entering a value at the **individual fuel tanks (1)**, or by setting the **total** amount **(2)**.
Enter the amount of fuel via the MCDU's numeric keypad. The amount will be displayed on the MCDU's scratchpad. To enter the amount of fuel to an individual tank, click the appropriate Line Select Key next to the fuel tank. If you are entering a total fuel amount, click the 6L LSK. The total fuel will automatically be distributed between all five of the A320-X's fuel tanks.

Note: These settings are fully dynamic and may even be changed while airborne.



REMOTE REFUELLING PANEL

On the real A320, a refuelling panel is located on the fuselage beneath the right wing. The FSLabs A320-X includes an exact replication of this refuelling panel that is fully functional and can simulate the fuelling or de-fuelling procedure.

The refuelling panel is only accessible through a web browser. Currently, FSLabs supports the following browsers: Microsoft Internet Explorer, Edge, Mozilla Firefox and Google Chrome. Apple iPad, iPhone and OSX users may download the Google Chrome browser from the App Store. The browser can be located on the same computer as P3D or any PC, tablet or phone that is connected to the same network as the computer running P3D.

Use one of the following addresses to display the panel:

- If the browser is located on the same computer as P3D:
  localhost:8080/Panels/800VU/800VU.html
- If the browser is located on a remote PC or tablet:
  192.168.1.1:8080/Panels/800VU/800VU.html

  Note: You must replace the IP address in bold print with your P3D computer's IP address.

The following functions are available:

Fuel Quantity Selection – (1)
Set the desired fuel amount by toggling the switch between 'DEC' (decrease) and 'INC' (increase).

Mode Select – (2)
Lift the guard on the mode switch up for refuelling or down for defueling. This will start the fuel flow in the selected direction.

Refuel Valves – (3)
The 'NORM' setting is sufficient for normal refuelling operation. You can opt to manually open and close the three refuel valves.

High Level Lights and Test
These lights will light up as soon as a tank has reached maximum capacity **(4)**. Use the test switch to test these lights for proper indication **(5)**.



Screenshot of the Remote Refuelling Panel taken on an iPad using the Chrome browser

Note: In order for the refuelling to work, the aircraft's engines must be turned off and external or APU power established.

Remote MCDU

The FSLabs A320-X offers you the ability to run the MCDU remotely as well. As the Remote Refuelling Panel described above, the remote MCDU unit is only accessible through a web browser that can be on the same computer as P3D or on a networked PC, tablet or other device. Currently, FSLabs supports the following browsers: Microsoft Internet Explorer, Edge, Mozilla Firefox and Google Chrome. Apple iPad, iPhone and OSX users may download the Google Chrome browser from the App Store.

Use one of the following addresses to display the MCDU:

- If the browser is located on the same computer as P3D, enter the following address: localhost:8080/mcdu/mcdu.html
- If the browser is located on a remote PC or other device which is on the same network as the computer running P3D, enter the following address: **192.168.1.1**:8080/mcdu/mcdu.html

  Note: You must replace the IP address in bold print with your P3D computer's IP address.

You may switch between the Captain's and First Officer's MCDUs by clicking the white round buttons at the top. The button then turns green and indicates whether the left or right MCDU is displayed.

*Note: The brightness control buttons on the **remote** MCDU are not functional. Use your device's screen brightness settings instead.*



Screenshot of the MCDU taken on an iPad using the Chrome browser

Flight- and Fuel-Planning

The A320-X offers you several convenient methods to perform flight- and fuel planning. For flight planning, the MCDU can be used to request and receive flightplan data created using an external flight planning software (such as *Professional Flight Planner X* ("PFPX") or *simBrief*). Loading a route this way simulates a datalink between the aircraft and the flight dispatch service. A second, similar method is to utilise the MCDU to search for suitable flight plans on the internet and online ATC networks. Generating a route this way simulates accessing externally stored company flightplans via datalink. For fuel planning, the FMGC is capable of calculating the fuel required for loaded flightplans.

These functions (called "AOC" functions) are available on the actual A320 aircraft and are replicated in FSLabs' A320-X to provide the user with an easy way of generating a realistic flight plan along with the possibility to do fuel planning.

Another option is to load routes stored within the FMGC or as files on your computer. These routes can be created using various flight planners or route creating tools, and then get stored, to be loaded during the pre-flight setup.

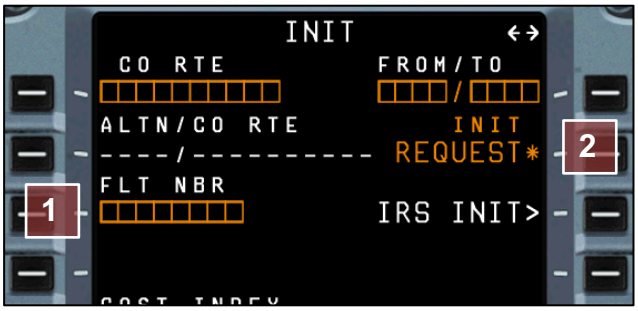
FLIGHTPLAN REQUEST

The primary (most realistic) way of loading a flightplan is by using an Operational Flight Plan (OFP) package, built by a flight planning software and downloaded to the aircraft via datalink.

To load an **Operational Flight Plan** into the FMGC, go to the INIT page:

- **Entering a Flight Number**. Enter the exact flight number including the airline identifier into the scratchpad (for example BAW711). Press LSK 3L **(1)** to enter it into the FLT NBR field (Note: You should NOT enter anything into the CO RTE or FROM/TO fields).
  Then select 'INIT REQUEST' **(2)** to initiate the flight plan request.
  If a route is found in the folder specified below, "AOC ACT F-PLN UPLINK" will appear in the MCDU's scratchpad. This will indicate that a flightplan has been loaded into the FMGC.

  For VATSIM / IVAO users:
  If no locally stored file is found, then it will look on the VATSIM or IVAO network servers for a pre-filed or filed flightplan.



Accepted files and file types	Accepted file names
OFP PFPX (file extensions: .txt or .pdf) **OFP simBrief** (file extensions: .txt or .pdf) **XML** (simBrief OFP XML-file .xml)	The default file-name given by flight planning software can be used. Make sure that the file name contains the flight number. For example: - EZY13PJ_LSGGEGGP.txt - AUA303 LOWW-EKCH (23-Feb-2019) #1.pdf

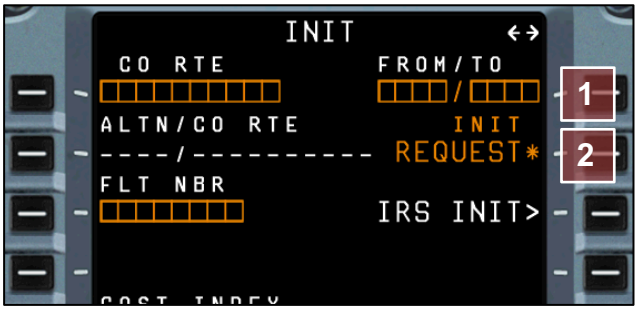
Accepted file location
[Public Documents]\FSLabs Data\Routes

Important Doing an INIT request with an OFP will automatically generate and load a flightplan into Prepar3D. If you use ActiveSky for your flights, run the software **before** performing the INIT request for the OFP, as this will send the flightplan to ActiveSky as well.

There is one method to utilise an **online** route creation tool to automatically **generate** a route for you to use:

- **Entering the Identifiers for the Departure and Destination Aerodromes**. Enter the ICAO identifiers into the scratchpad for the departure and arrival airports. The identifiers should be separated by a slash and there should be no spaces (for example, LGAV/LOWW). Press LSK 1R **(1)** to enter into the FROM/TO field (Note: You should NOT enter anything into the CO RTE or FLT NBR fields).

  Press the LSK 2R at 'INIT REQUEST' **(2)** to initiate the flightplan request. If a route can be generated, the CO RTE field in the upper left of the display will be populated with a route name and "AOC ACT F-PLN UPLINK" will appear in the MCDU's scratchpad. This will indicate that a flightplan has been loaded into the FMGC (without runway, SID or STAR information which you may still insert).



LOADING / IMPORTING A STORED ROUTE

There are different methods to utilise the loading of a **locally stored route** on the INIT A page of the FMGC:

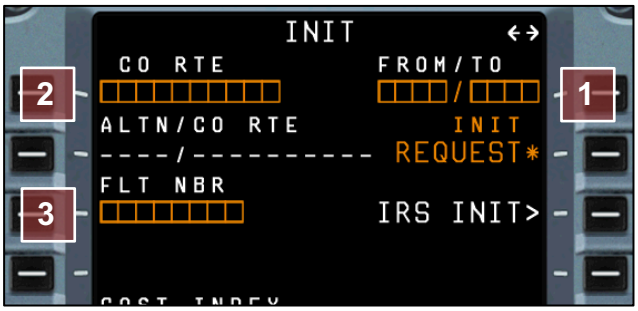
(1) **Entering the Identifiers for the Departure and Destination Aerodromes**. Enter the ICAO identifiers into the scratchpad for the departure and arrival airports. The identifiers should be separated by a slash and there should be no spaces (for example, LGAV/LOWW). Press LSK 1R **(1)** to enter into the FROM/TO field (Note: You should NOT enter anything into the CO RTE or FLT NBR fields).

All saved flightplans and routes between the specified airports will then be displayed. Choose between the available flightplans using the arrow keys. Then insert the desired flightplan.

(2) **Entering a Company Route Designator**. This will load a previously saved flightplan.

- or –

It will import a flightplan, which was created with a flight planning tool and exported into various file formats. See below for details.



<u>Note</u>: Flightplans stored using the 'DATA'-page will have priority over those created externally.

Accepted files and file types	Accepted file names
PLN (P3D flightplan file .pln) **ROUTE** (PFPX route file .route)	ICAO code I ICAO code I 2 digits - For example: EGLLEDDM07 - or - IATA code | IATA code | 2-4 digits - Examples: LHRMUC07Z2 or LHRMUC07 or LHRFRA07Z

Accepted file locations
For P3D flightplan files (.pln) [User Documents]\Prepar3D v4 Files **For PFPX routes (.route)** [Public Documents]\PFPX Data\Routes

RECEIVING A FLIGHTPLAN FROM PFPX / SIMBRIEF

In addition, the A320-X can receive flight plans sent by a flight planning tool, “Professional Flight Planner X” or “SimBrief”. This is implemented in a way which simulates a ground station sending (or pushing) a flightplan to the aircraft using a satellite datalink. A small number of airlines use this function to have OFPs sent to their aircraft by flight dispatch.
You may use this service if PFPX or SimBrief is installed on the same computer as P3D, or on another computer within your network.

PFPX

How to push a flightplan to the aircraft using PFPX:

1. Before starting to plan the flight: make sure that the PFPX OFP format is set to “PFPX”.
2. Plan, compute and release the flight as usual.
3. Make sure that the simulator is running, and the aircraft is powered up.
4. In the toolbar press the **save** button in the “**Briefing Package**” column.
5. Navigate to the folder …[P3D v4 add-on folder]**\FSLabs\AOCService\Uplink**
6. Select the one folder you see displayed as the file’s destination (Example: 127.0.0.1-4555-NAV1903001).
7. Then save the file into this folder.
8. After a few seconds the flight plan will automatically be loaded to the FMGC, indicated by the uplink message.

SimBrief

How to push a flightplan to the aircraft using SimBrief:

1. Before starting to plan the flight: make sure that the SimBrief OFP format is set to “LIDO”.
2. Create a new flight as usual.
3. Make sure that the simulator is running, and the aircraft is powered up.
4. Select **Generate OFP**.
5. Select **Download FMS**.
6. Scroll to the FSLabs A320 entry, and click the **Download** button.
7. Save the file to the following folder:
   …[P3D v4 add-on folder]**\FSLabs\AOCService\Uplink**\127.0.0.1-xxxx-xxxxxxxxxx).
8. After a few seconds the flight plan will automatically be loaded to the FMGC, indicated by the uplink message.

RECOMMENDED FLIGHT PLANNING SOFTWARE

To best experience the extent of the datalink features modelled, Flight Sim Labs recommends using one of the following programmes, capable of producing Operational Flight Plan files (OFP):

Professional Flight Planner X
PFPX can be purchased directly at the FlightSimSoft website:

www.flightsimsoft.com

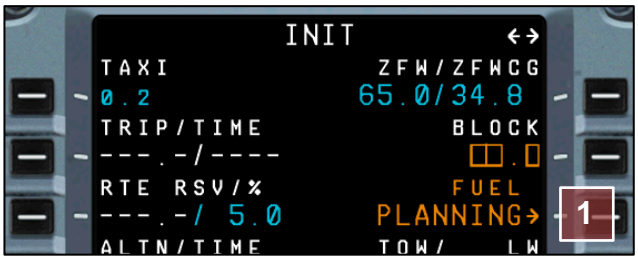
SimBrief
SimBrief can be accessed for free at the following website:

www.simbrief.com
Consider making a donation to the developers if you like the software.

FMGC FUEL PLANNING

If you do not own any flight planning software, you may use the built-in fuel planning function the A320's FMGC provides. It will calculate fuel requirements according to the active flightplan.

Access the fuel planning function on the INIT B page of the FMGC. You will see the corresponding prompt next to the LSK 3R **(1)** after Zero Fuel Weight and ZFW Centre of Gravity have been entered at LSK 1R.



Note: Engines need to be off for this to work. Also make sure that you enter the route as complete as possible including the SID and expected STAR and approach. This will allow for a precise calculation.

*Using the Fuel Planning function only **computes** the required fuel estimates. You must separately load the fuel as in the real aircraft!*

Route Saving and Loading

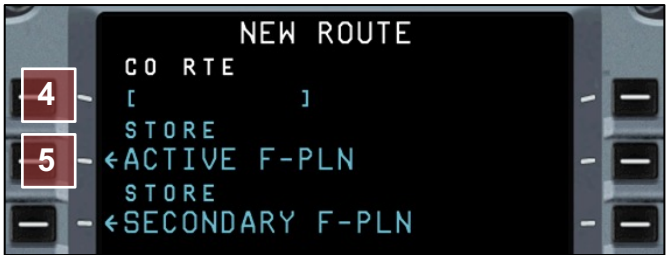
DATA PAGE

The FMGC contains a function to save pilot-generated routes.
Use the MCDU to access the DATA INDEX page:

1. Press the 'DATA' key on the MCDU.
2. Use the left or right arrow key to go to the 2nd page.
3. Select the LSK next to 'PILOTS ROUTES' to access the NEW ROUTE page:

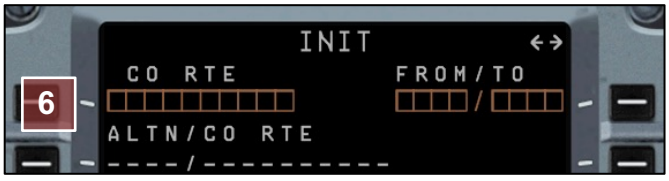
(4) Type in a name for the route you want to save.

(5) Press the LSK 2L to store the route presently being the active flightplan.



(6) To load a previously saved route, use the 'INIT' page's 'CO ROUTE' entry.

Type in the name under which you saved the route into the scratchpad and press LSK 1L.



Note: To increase the number of possible stored routes, go to the FMGC options page. For details see chapter 4.

Icing

The aircraft includes a fully-featured icing simulation, requiring you to keep in mind the consequences of cold weather, precipitation, icing conditions and de-icing requirements.
The following icing-related features are available:

- Airframe ice accumulation while being parked or taxiing on ground
- Engine fan blades ice accumulation on ground
- Airframe and engine ice build-up inflight
- Pitot icing
- De-Icing fluids and holdover times

All these items are simulated with their realistic consequences. They are also linked to visual effects on the aircraft, so that you can see what is going on, like you would be able to on the real aircraft.

DE-ICING ON GROUND

If it is determined that de-icing is required, through visual inspection and/or weather data, the process can be done using different methods:

- GSX: If you own the GSX add-on, de-icing can be called for by talking to the ground crew. This is the realistic way with de-icing trucks visible.
- MCDU option pages: If you don't own GSX, OR if you want to de-ice on a remote de-icing pad, de-icing can be started using the MCDU option pages. De-icing will take a realistic amount of time depending on the amount of contamination, but you will not see de-ice trucks outside doing their work.

Both options are linked to the Flight Sim Labs' own icing simulation model, clearing the contamination and starting the clock on the holdover time.

GSX
Refer to the GSX manual on how to start the de-icing process. It is quite simple really, you only need to call the ground crew and request de-ice, with the fluid type of your choice. GSX will then do the rest.

MCDU Option Pages

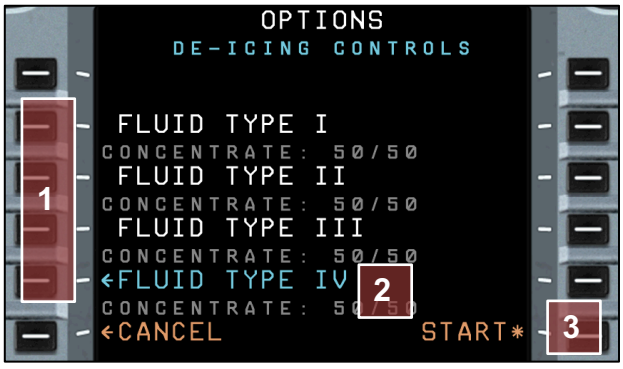
To access the de-ice menu:

1. On the MCDU press the '**MCDU MENU**' button.
2. Select '**<EXT CTRLS**' using the LSK 6L.
3. Select '**DE-ICING>**' using the LSK 5R.

Once you are in the MCDU de-ice menu:

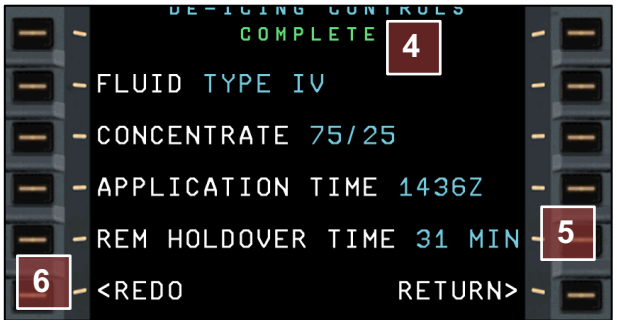
- Select the required fluid type by using the LSK 2L to 5L **(1)**.
- Use the arrow-keys to select different fluid concentrations.
- The selected fluid type will then be highlighted in blue **(2)**.
- Select 'START' **(3)** to commence de-icing.

Note: For an aircraft like the A320 family, type IV fluid is usually applied. This ensures that the fluid will have washed off at the aircraft's rotation.



De-Icing Completed:

Once the de-icing process is completed, you will be presented with a report **(4)**. This allows for determination of the holdover time, within which you need to get airborne.



- For convenience the remaining holdover time is displayed next to LSK 5R **(5)**
- In case you need to redo the de-icing process, perhaps because it is determined that departure is not possible within the remaining holdover time, press the LSK 6L **(6).**

Note: This de-icing summary report is also available after de-icing has been done using GSX.

ICE PREVENTION

On Ground
Wing anti-ice is not working on ground. You must de-ice the aircraft before departure to get rid of frost, ice and snow. Furthermore, engine anti-ice must be used in icing conditions.

However, engine anti-ice does not protect from all icing related dangers. An engine can still accumulate ice on the fan blades, which can be shed by following the run-up procedures laid out in the A320 Normal Operations document.

Airborne
Icing conditions exist whenever the true air temperature (TAT) is below +10°C and visible moisture (clouds, fog, rain, snow) is present. No icing occurs when the static air temperature (SAT) is below -40°C.

Engine anti-ice should always be selected in icing conditions.
Wing anti-ice is only needed if ice is actually accumulating on the airframe. There are two options to detect ice accumulation, both are simulated:

- Ice detectors that consist of sensors producing ECAM alerts in case of ice build-up.
- Many A320 family aircraft are not equipped with the sensors mentioned above (they can be removed in the MCDU option pages). There is however an icing probe installed at the centre of the front windshields. Ice build-up can be observed visually. At night the probe can be illuminated by the compass light.

Be aware that severe icing can have serious effects that might not always be cured by anti-ice systems. Severe icing may freeze up your pitot tubes and will cause loss of speed information. In cases like this it is recommended to climb or descend out of the icing layers.

SIMULATED ICING CONSEQUENCES

Ignoring icing and its threats can have various consequences with different warning signs. Consequences range everywhere from a mild increase in engine vibrations to a sudden loss of airflow followed by a stall.

Iced-up wings
Wings contaminated with ice are programmed to generate following consequences:

Lift: During the early icing stages, lift is indirectly affected by progressively reducing the stall angle of attack, but without affecting lift at low angle of attack.
When icing becomes more severe, it will also affect the lift in the second regime. As a result, any manoeuvre involving an increase in g-load can lead to a stall.

Drag: Icing increases the zero-lift drag coefficient. While lift is being deteriorated, induced drag increases dramatically.

Iced-up engines
Engine icing is programmed to occur in these conditions:

- Freezing fog, drizzle or rain
- Heavy Snow

Any of the above conditions **and** engine N1 rotation above 10% and less than 48% will result in an ice build-ip. Above 48%, any engine ice will be shed within 30 seconds.

Icing effects on the engines are gradual, but a completely iced up engine will:

- Reduce thrust by 20%
- Increase EGT by 35°C
- Increase N1 vibration by 10, and N2 vibration by 5

Hints from A320-rated Pilots

The team behind the A320-X includes many A320-rated pilots currently flying with various airlines around the world. They share some of their insights and hints about flying the A320 in their own words.

MANAGING DESCENTS

by X24 (Christopher Allan)

60T GW is a convenient median value, above which we know we're starting to feel the weight more and all that implies. We make a point of mentioning that fact during the arrival briefing - gets harder to slow down if you have a tailwind at the top of the ILS for instance, which is pretty typical around Melbourne. Vls can be a problem if you haven't anticipated this - she won't go down and slow down so you have to get in early. Then there's short runways = hot brakes, etc.

Conversely, below 60T, lighter, don't mind so much when ATC asks you maintain 180 kts till 6 miles, clattery landings, cooler brakes, quicker to turn around 'cos not so many passengers so the cabin crew are a little less frazzled, and it means the weather's good 'cos we have less fuel remaining.

Because you only get half speed brake with the autopilot engaged, you can disengage the AP, use full speed brake, then re-engage the AP. Done that a few times. Here are some numbers most of my colleagues seem to use to assess how the descent profile is looking. Once you get used to this you can tell quite quickly if you're starting to get high or low or it looks like you're going to. We don't necessarily always trust the flight guidance implicitly, and these are really useful raw data gross error cross-checks.

In round figures, 1000/IAS = miles per thousand feet. So at 300 knots, very close to 3 miles per thousand (3.3), at 250 knots - 4 miles per thousand, and 200 knots - 5 miles per thousand. Those are easy to do in your head. That's clean - 200 will be pretty close to green dot at medium weights. As you slow down, the glide flattens out. Green dot is best lift/drag speed. They say it takes a mile in level flight to lose 10 knots, bit less if you're light.

From 10,000 ft, a 4x profile works really well for the A320, i.e. 4 x the alt in 1000's of feet, so at 5000' you want to be at 20 miles, 4000 at 16, 3000 at 12-13 and aim for green dot at 13 miles.

This makes it easy to see if you're getting high or low. If low, we might VS it to match the blue bottom of descent arrow with the white continue descent arrow. If high, so OP DES, tweak the speed up a few knots, bit of speed brake, watching the blue arrow to see where bottom of descent will be so as to try and have a bit of a level segment to wash the speed off rather than try to do it while descending. In rare cases, getting slowed down and held up because of traffic, I've had flaps 1 out at 7000 feet.

We'll be around 17 miles out doing 230, when ATC tells us to reduce to 190. As soon as the brakes are out (and remember you only get half deflection with the AP engaged), the Vls begins to climb and as it reaches our indicated speed of 230 we back the brakes off a bit to control the Vls, and once below 230 knots, select flaps 1 which then causes Vls to quickly reduce.

- Part 2 -

To comply with ATC speed requirements, I generally select the speed (rather than MACH), especially below the Mach/SPD crossover altitude. SPD rather than MACH also makes it easier to achieve RTAs accurately.

Once the winds have been put in, it gives the FMGS a forecast cross-section of the atmosphere for predictions - the operative word being "forecast". A managed descent out of a 160kt tailwind that suddenly drops off can result in an over-speed if you're not ready for it, and the aeroplane will quite happily allow this. Surprisingly given that it is fly-by-wire, i.e. software-driven, there are noticeable differences between airframes when it comes to speed handling. If high on profile with speed and descent managed, some aircraft will put their heads down and allow the speed to overshoot the top end of the buffer and get right up to the bottom of the "bricks", still accelerating. Speed-brake is usually enough to prevent an over-speed and cause the nose to pitch up and the speed to decay if you get in early. Otherwise, I've seen people have to disconnect, close the thrust levers and manually level off. This can all happen very quickly, particularly at higher altitudes, especially descending out of a strong tailwind that reduces rapidly with altitude. I typically start descent 5-10 miles early, which starts off nice and gentle at 1000 fpm and with no surprises.

Also, being within 2-300' of an altitude restriction on a STAR is considered satisfactory by the aircraft. Accordingly, to meet a *limiting* STAR requirement of at or below 9000', I put in -8700. Murphy's Law states that if you don't amend the altitude, it will go through at 9300 feet, and if you do, it will go through at 8700 feet!

- Part 3 -

Fuel is a huge cost to us, so we operate at CI 15, and depending on weight and wind, the FMGS will often program a descent speed of .76 - .77/270 - 280. If less than 280 knots, company policy is to enter /280 on the DES PERF page. Descending early, say 5 - 10 miles, initiates a descent at 1000 fpm. The behaviour of the thrust depends on whether the descent winds have been entered and how the actual winds compare to the entered winds. The FM uses this to decide if it is high or low and adjusts thrust and/or pitch accordingly. If low, the speed will tend to reduce to the bottom of the speed bracket - target minus 20 - but because ATC expects us to maintain a certain speed, we generally then select 280, or 250 if below 10,000'.

Initially, when commencing the descent, thrust will reduce to idle to stop the aircraft accelerating, but once the FM has had a chance to evaluate the profile, thrust may well increase again. In a managed descent, the FMA quite often flickers between THR IDLE and SPEED as it tries to maintain the profile and the programmed speed.

MANAGING DESCENTS

by Flyingspanner

On the A320, when managed descent is initiated before the calculated descent point, the aircraft will put you into a 1000ft/min descent until the calculated rate meets the current profile for the descent. The aircraft will then adjust its thrust for the descent mode. The FMA call for this on the A320 is "THR IDLE" - HOWEVER, this is not actually a true statement. Actually, some thrust is kept on to maintain the descent profile and keep the green profile dot in the middle. This can cause speed to build up to almost reaching the descent speed +20 upper band (around the +15-17 mark). it is only then that the the engines actually go back to an idle setting, confirmed by the flashing IDLE on the Upper ECAM in-between the 2 engine EPR displays. Once it reaches this point, the aircraft then tries to slow down and maintain the calculated profile, slowing down to the target airspeed, sometimes with varying degrees of accuracy depending on the descent winds etc.

Lastly, in the airline I work for, we are using a variable cost index, which alters the descent speed. For example, a CI of 50 gives a descent speed of around 320kts. If you are kept high (by ATC), this does not give much speed allowance to make a fast descent to regain the profile. I generally like to use a descent speed of around 290kts. That way if kept high, I can go fast to get down and then slow down (my old instructor used to say: "its easier to go down, then slow down than to slow down and go down!" We also use an Idle Performance percentage to reduce the computed track miles for descent on the profile by about 15 miles to try and maintain a higher altitude for longer before the descent.

MANAGING DESCENTS

by Aerlingus231

Managed descents are a quite inconsistent to be honest. As a rough guide, it responds slowly initially to deviations but then will progressively reduce the pitch up to the point where it'll quite happily put you in a dive of death in excess of -4500 fpm with no qualms to try and regain the computed profile. Descents are quite the dark art in the A320, In most jets to be fair, the computer will only roughly put you in the ball park and will quite often need intervention in the form of VS/Op Des and manually adjusting the speed to accurately manage your profile.

Entering the actual spot winds on the way down can help, particularly in the case of tailwinds on the descent. But invariably, most of the time, the winds we have are spaced in gaps of 8,000' +, and the computer will consider that the wind changes evenly across those 8000' from the first level to the next. In reality, the swing tends to happen across 2,000-3,000', meaning the computer gets a bit of a surprise, and in turn, gives us a bit of a surprise with its attempts to regain the profile. I agree with the general concept though that it does reduce the severity of its inconsistencies and does better plan the track millage required for the descent.

MANAGING CROSSWIND LANDINGS

by Bus_Driver

I keep the crab all the way until about 30 feet, then kick it straight with rudder (if it's really strong leaving 5 degrees crab on touchdown) simultaneously when bringing out the crab applying enough sidestick to prevent the wing lifting. Again, if the wind is really strong, I keep about 5 degrees drift and a small amount of wing down at touchdown.

Once on the ground the aircraft tends to track down the runway pretty easily, and is easily controlled with the peddles. The autobrake makes our life easier (particularly in the simulator); in real life it seems to want to stay straight better than in the simulator.

PS: you see a lot of people saying the A320 is tricky in a crosswind, personally I have not found this to be the case - even in a maximum crosswind (38kt)

6. HELP & SUPPORT

Questions & Answers

To help you with issues and answer questions you might have, head over to the Flight Sim Labs support forum which features an up-to-date Q&A section:

http://forums.flightsimlabs.com

Manuals & Documents

The following documents are available to help you get flying easily, as well as using the correct procedures and workflows:

- **Introduction Guide**
  The document you are reading right now. Contains information on how to install, configure and use the A320-X.

- **Flight Checklist**
  Use this checklist on every flight you do. You will notice that it is a very slim checklist. This is because many items are handled or displayed by the avionics and therefore do not need to be on paper anymore.
  The backside offers many limitation figures helping you during the operation of the aircraft. Other limitations are either displayed on the screens or printed right onto the main panel.

  Should you have access to a paper lamination device, this would be the perfect document for that. It gets tossed around quite a bit during daily operations but needs to be readily available at any time.

- **Normal Procedures**
  Follow these procedures to fly the A320 exactly the same way as the airline pilots do.
  Note that the ultimate goal would be to know all content of this document by heart. The more you fly the A320, the easier this will be.

- **Basic Tutorial**
  A tutorial flight covering a short flight across Europe from Vienna (LOWW) to Copenhagen (EKCH).

- **ATSU Tutorial**
  A tutorial covering all datalink-related workflows using the ATSU and AOC system.

- **Aircraft Options**
  A document to detail all available options that can be set per airframe, and how these files are set up.

- **Parking Stands**
  Explains how to customise parking stand information for a specific airline, used to simulate receiving an ACARS company message to advise which parking stand to expect on arrival.

P3D Settings Recommendations

Since the FSLabs A320-X is one of the most sophisticated and highly complex add-on aircraft available today, it too needs its fair share of CPU power to run. In order to prevent you from suffering with stutters and low frames per second (FPS), you will find some helpful recommendations below on how to configure your simulator in order to ensure the best experience with the A320-X.

CLOUD TEXTURES

There are texture replacement add-ons on the market that improve the visual quality of cloud textures. Many of them give the option to install “ultra high resolution” textures, or in other words a cloud texture size of 4096x4096 pixels.
Larger texture sizes often give clouds an over-sharpened appearance with edges and contours much more defined than real clouds. FSLabs recommends a cloud texture size of 512x512 pixels for cirrus clouds. We think that this setting offers an optimal balance between visual appeal and utilization of a minimal amount of memory bandwidth.

Note that it is not enough to simply limit the “Texture Resolution” setting in your P3D settings to 1024. You must go into the settings of your texture replacement program and select the lower texture size. If you don’t, then the 4096 pixel textures will still be read and loaded into memory before being displayed.

SCENERY TEXTURES

Another trend for ultra-high-resolution textures is sceneries. Developers tend to use them as a marketing tool and to be able to show stunning screenshots of areas no one will ever fly or taxi the aircraft into.

Larger (4096 pixels) scenery textures can make sense with some parts of an airport, such as aprons and runways. However, it has been proven that textures this large on buildings will only be visible in full detail when the user is right in front of the building. This is something that is not possible while taxing or even parking an aircraft. While the highest level of detail is invisible to the user, it is still loaded into P3D, consuming valuable texture bandwidth and computing power.

It is therefore recommended to avoid using 4096 pixels textures with airport sceneries as this level of resolution will not always provide a visible difference which justifies the increased memory usage. If an airport scenery developer offers a “light” texture package with lower resolution, you can try it and see if you are satisfied with the visuals before opting for the higher resolution textures and the increased load on the system it will entail.

AI TRAFFIC

AI Traffic has become more detailed over the years, offering more complex visual models and numbers of aircraft, often matching real world traffic and schedules into major airports. Therefore, AI traffic has evolved into another consumer of valuable CPU power.

Recently, some AI Traffic models have been made available with optional 4096-pixel textures offering an incredible amount of detail. As is the case with scenery textures above, it is recommended to stick to a maximum of 2048 pixels with AI Traffic textures.

P3D RESTART

P3D is not very good at flushing data that has accumulated during a flight or from a previously loaded aircraft. FSLabs strongly recommends that you restart P3D if you want to switch from one A320-X livery to another or from another complex add-on aircraft to the A320-X.

Credits

The following individuals have all contributed to the A320-X and helped making it reality:

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An inspiration to us all